The Engineering and Mining Journal

VOL. LXXXVIII. NEW YORK, DECEMBER 11, 1909. NO 24.

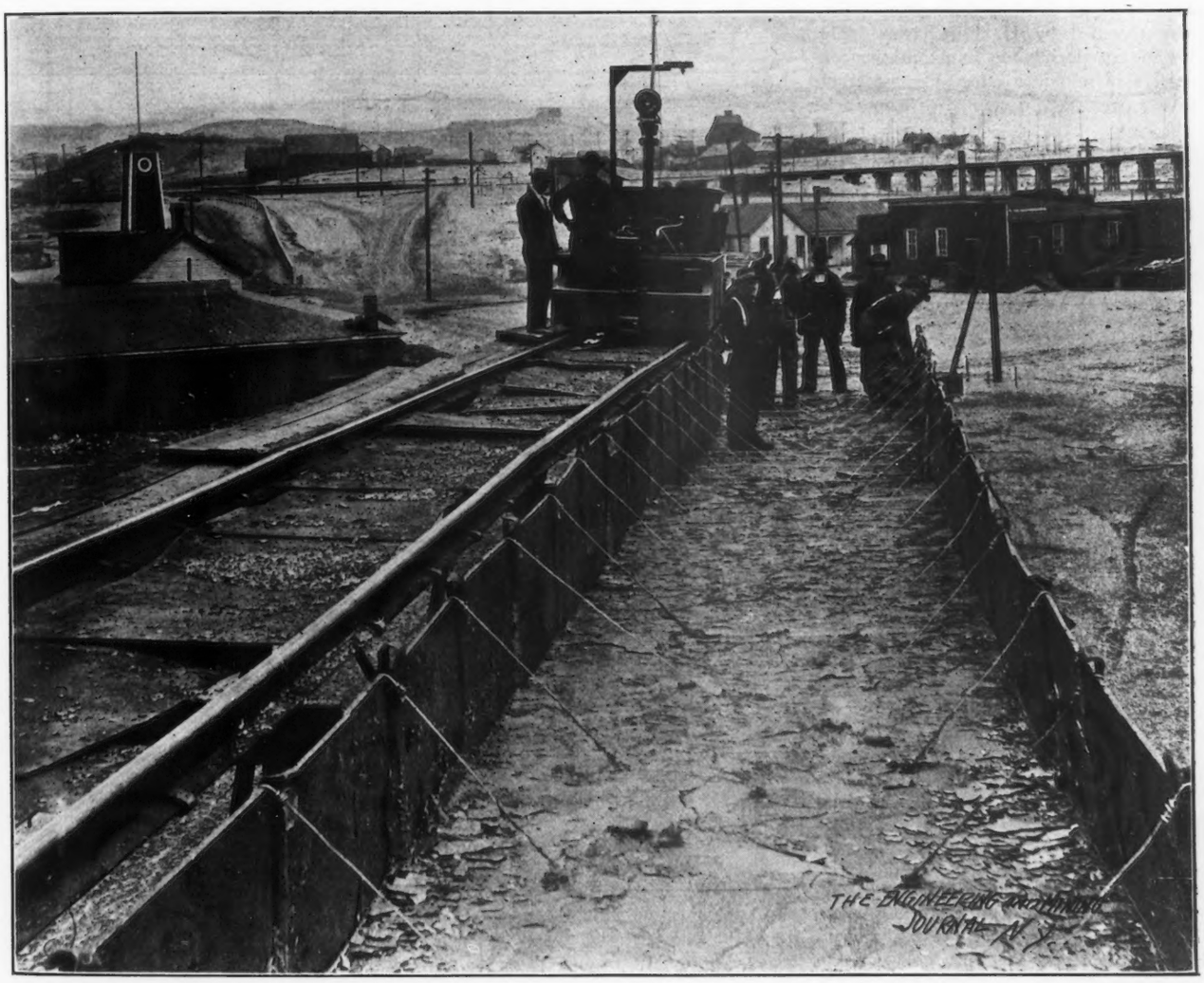
Smelting Plant of the Butte Reduction Works

A General Outline of the Equipment and the Operation Together with Some Special Features; the Slag Is Used for Culvert Construction

BY A. H. WETHEY*

The first-class ore received for treatment at the Butte Reduction Works is sampled, after crushing, by an automatic sampling device, which was designed by James Doull. This machine is an apparatus whereby the operation of taking one shovelful at regular intervals is as closely duplicated as possible, and has proved highly satisfactory. It is simple but efficient, and has been in use since 1896.

The first-class ore, after being crushed in a 10x20 Blake crusher, passes over a trommel, which separates the coarse from the fine. The coarse material goes direct to the blast furnaces, and the fine material, or screenings, is put through the calcining or desulphurizing furnaces.



BUILDING THE SLAG IMPOUNDING WALL AT THE BUTTE REDUCTION WORKS

There are two blast furnaces, each 42x 124 in. at the tuyeres. These blast furnaces were built at the plant.

The calcining department consists of five Wethey furnaces, the structural-steel work for which was furnished by the Allis-Chalmers Company, and two MacDougall furnaces. The Wethey furnaces were first adopted in 1894, and have been in continuous operation since. These furnaces have each a capacity of from 70 to 80 tons daily.

The fine ore, after desulphurizing, is trammed to reverberatory matting furnaces. These furnaces are 80 ft. long by 20 ft. wide. The heated gases pass through Worthington boilers, made by the New York Safety Steam Boiler Company, The hot calcines from the desulphurizing furnaces are discharged into hoppers

*General manager for W. A. Clark, Butte, Mont.

located over the top of the matting furnaces, and the material is discharged through spouts leading through the roofs of the furnaces. The methods adopted in this respect are similar to those in use in other plants. The side doors used on these furnaces are, I think, unique, and were designed by James Doull.

The matte from the blast furnaces and from the reverberatory-matting furnaces is taken to the converters in ladles of 10-ton capacity, built by the Midvale Steel Company, Philadelphia.

Electric Converters Used

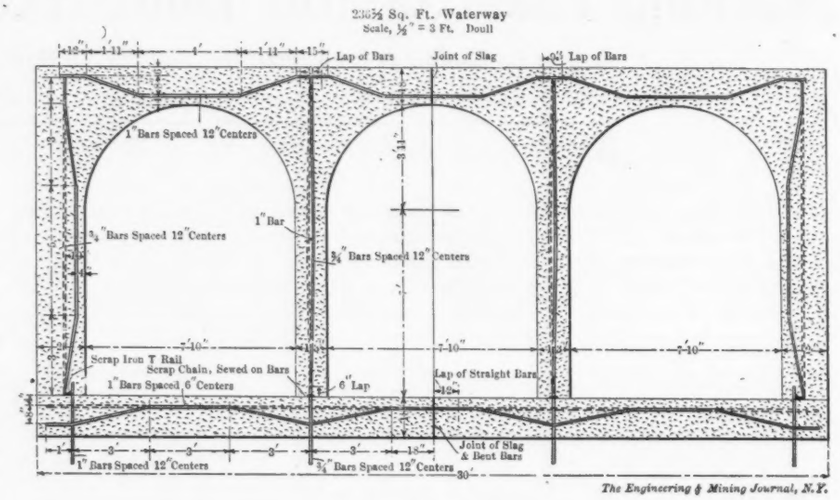
The converting department consists of three stands operated by electricity. In addition, there is a stand on which the shells are placed when newly lined, and the slag from the converters that are running is poured into the newly lined shell and the lining dried by this method. This was patented by H. L. Charles. This method of drying the lining in the converters is found to effect a considerable saving over the old method of using coke and wood.

The electric converters were furnished by the Power and Mining Machinery Company, Cudahy, Wis. The converters are 84x126 in. The method of connecting the converters to the flue is by means of a movable hood, designed by Mr. Doull, and is shown by an accompanying drawing. The converters discharge the pig copper, running about 99 per cent. copper, into molds placed on trucks operated by an air cylinder. The pig copper, when sufficiently cold, is loaded into cars and shipped to the Nichols Chemical Company, at Laurel Hill, Long Island. The steam generated from the waste heat of the matting furnaces is sufficient to run the entire converting department.

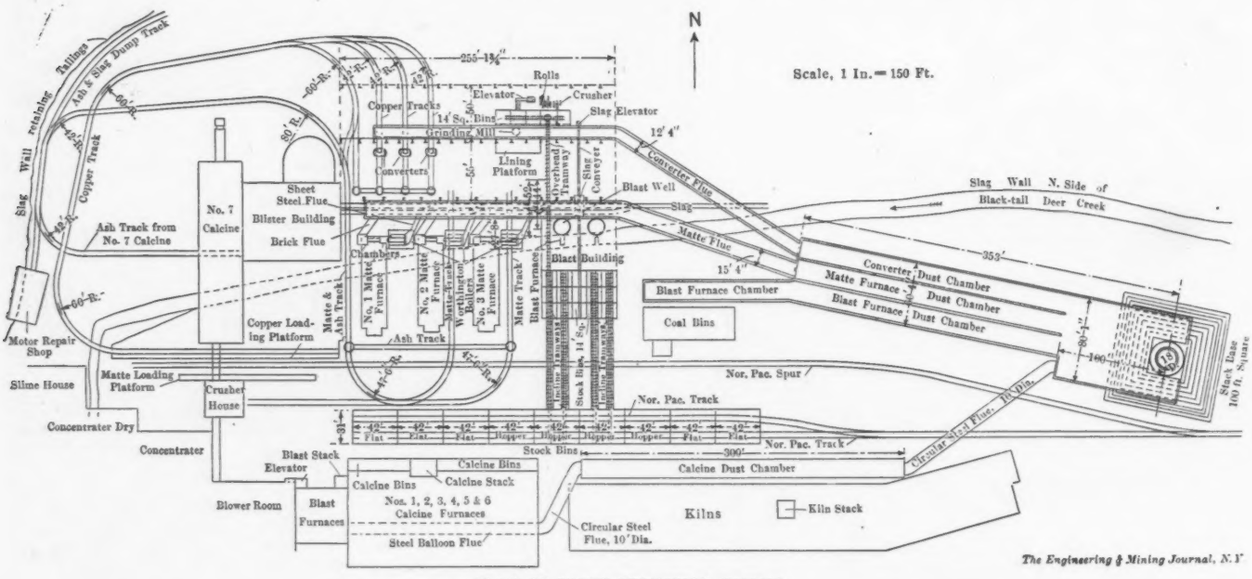
The blowing engine for them was built by the Ingersoll-Rand Company, and is 19x28x42 in., compound condensing, with air cylinders 42x42 in., furnishing 10,500 cu.ft. free air per minute at 15 lb. pressure.

There is also a 150-h.p. high-pressure Flemming engine, operating a 100-kw. Westinghouse generator, which furnishes the electric power for operating the converters, electric cranes, etc. A compound-condensing Ingersoll-Rand compressor furnishes the air at 100 lb. pressure, which is used around the works generally, and also in connection with the machines for lining the converter shells, and for operating the pneumatic machinery around the converters.

The material used for lining the converters is silicious ore coming from various points. At the present time the chief source of supply is the Snow Storm Mining Company, at Larson, Idaho. The ore for this department is all sampled over an automatic sampling device, which is an improvement on the device used in the smeltery department. The ore is crushed by a Blake crusher and Cornish rolls, and is mixed in a clay mill with a sufficient amount of clay to make it set properly when tamped into the converter shells. The converter shells are first lined with magnesite brick, furnished by the Harbison-Walker Refractories Company, Pittsburg. The shells are then lined with the mixed ore and clay to a thickness of 20 in., and tamped solidly into place with Ingersoll-Sergeant tamping machines.


23.65 Sq. Ft. Waterway
Scale, ½" = 3 Ft. Doull
Lap of Bars
Joint of Slag
Lap of Bars
1" Bars Spaced 12" Centers
1" Bar
¾" Bars Spaced 12" Centers
¾" Bars Spaced 12" Centers
Scrap Iron T Rail
Scrap Chain, Sewed on Bars
1" Bars Spaced 6" Centers
6" Lap
Lap of Straight Bars
Joint of Slag & Bent Bars
1" Bars Spaced 12" Centers
¾" Bars Spaced 12" Centers
The Engineering & Mining Journal, N.Y.

REINFORCED SLAG CULVERT



PLAN OF BUTTE REDUCTION WORKS

No Underground Flues

There is an extensive system of flues and chambers for collecting the flue dust coming from the various furnaces and connecting with a reinforced-concrete stack 18 ft. in diameter throughout and 352 ft. high, built by the Weber Steel-Concrete Chimney Company, Chicago. This stack has been in constant service for over three years, and shows no signs of wear. Plans of the flues and stack accompany this article. The main dust chambers have an

internal area of 700,000 cu.ft. The calcine auxiliary chamber has an internal area of 75,000 cu.ft. The calcine balloon flue is 10x15x180 ft. long. The converter balloon flue is 10x15x425 ft. long. The matte furnaces are connected by a brick flue 14x10x400 ft. long. All flues and dust chambers are elevated above the surface so as to make them easily accessible underneath for collecting their contents. There is no underground flue in the plant.

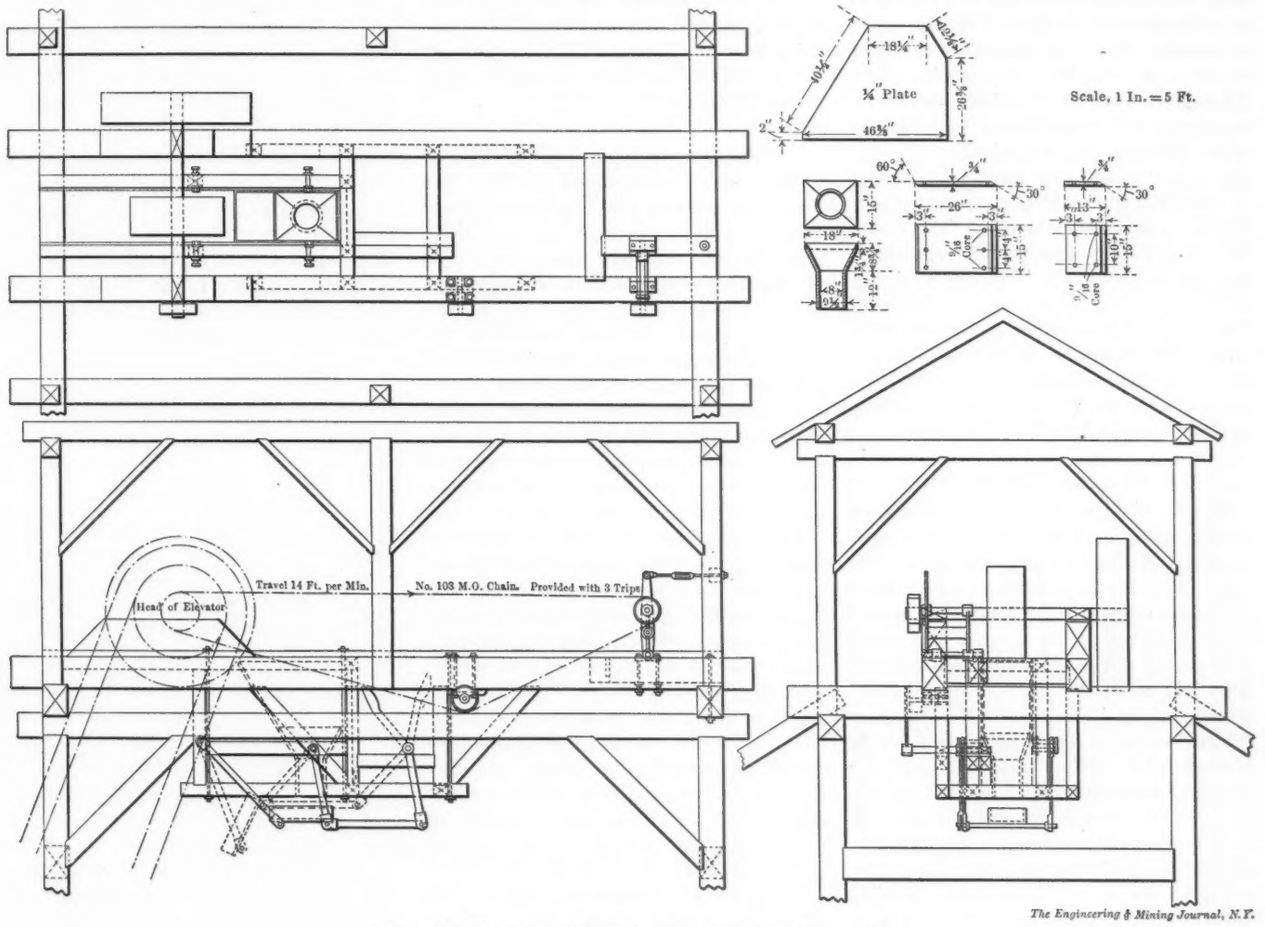
Reinforced Slag Construction

The plant is situated on the banks of Silver Bow creek. The ground here is level and considerable care has had to be taken to prevent the slag from the furnaces and the tailings from the concentrator from encroaching on the creek. In order to do this, cast-iron plates are put up along the creek and the molten slag poured in between them, and as they fill they are moved until a solid wall formed from molten slag is constructed on each side of the creek.

The tailings from the concentrator commenced encroaching upon the creek also, and to protect it a flume was built of reinforced-steel concrete. This was expensive construction, costing about $70 per lineal foot. During the last year another section has been built of molten slag in connection with steel reinforcement, as shown by an accompanying design. This method of construction is much cheaper than the concrete culvert. The concrete culvert was designed by Mr. Tilton, chief engineer of the San Pedro railroad, while the slag culvert was designed by Mr. Doull.

The new Venezuelan mining law requires that all powers of attorney made in the United States for use in Venezuela should be certified in order by: (1) An officer having a seal; (2) by the secretary of state in the State where made as to the competency of the acknowledging officer; (3) by the Secretary of State of the United States as to the signature of the secretary of state of the State; (4) by a diplomatic or consular officer of Venezuela, certifying that the signature of the Secretary of State of the United States is his usual signature. Then same must be presented at the ministry of foreign relations of Venezuela for authorization.

The foundation stone of the radium works which is being built in Thomas street, Burdett road, East London, was laid on Oct 14. The factory is being erected to treat the pitchblende found at the Jrenwith mine in Cornwall.


Scale, 1 In. = 5 Ft.
¼" Plate
Travel 14 Ft. per Min.
No. 103 M.O. Chain. Provided with 3 Trips
Head of Elevator
The Engineering & Mining Journal, N.Y.

CRUSHER-HOUSE SAMPLER AT BUTTE REDUCTION WORKS

Physiological Effects of High Temperature and Humidity

By George J. Young.*

Much has been written regarding the effects upon the human system of poisonous and other gases, but very little is to be found in mining literature concerning high temperature and humidity. Le Neve Foster says: "In still and saturated air it is hardly possible for men to do continuous work above 90 or 95 deg. F., even when stripped to the waist. At higher temperatures in saturated air the amount of work possible becomes less and less, and the body temperature may rise rapidly, though men accustomed to the heat can bear it much better than others. At temperatures above 90 deg. it becomes difficult even to remain without working. Thus, at a temperature of 93 deg. in still and saturated air, I found that, though I was stripped to the waist and doing practically no work, my temperature rose 5 deg. in two hours, and was still rising

Note—Excerpt from preliminary proofs, not revised by author, of a paper read before the ninety-seventh meeting of the American Institute of Mining Engineers.

*Professor of mining and metallurgy, University of Nevada, Reno, Nev.

rapidly when I found it necessary to come out. On the other hand, it is a well-known fact that if the air is dry much higher temperatures can be borne with ease and comfort. In collieries where the air is fairly dry and in motion, men can work well at a dry-bulb temperature of 90 deg., or even 100 deg., and in hot climates with very dry air much higher temperatures are not oppressive."

Discussing the permanent effect of high heat upon the system, Eliot Lord reaches the following conclusion: "The ultimate effect of this extreme heat on the miners' constitution is not so easily noted. The mine levels differ materially in temperature, and the assigned station of a miner is so frequently changed from one cause or another that it is impossible to obtain at present complete comparative data. That prolonged labor in hot, impure atmosphere will assuredly shorten life appears indisputable; but whether the system is permanently or materially injured by intermittent working under those conditions is more questionable. The power of recuperation appears extraordinary, and unless the strain is intense and frequent no lasting injury may be inflicted. The limits of permissible strain vary with the relative power of endurance. The action of all the bodily organs appears to be stimulated by the heat, with the exception of the stomach alone."

No Lung Troubles

Messrs. Haldane and Thomas comment on exposure to high temperatures and sudden variations of temperature as follows: "Miners are exposed to high temperatures underground and to comparatively sudden cold on coming out, often with damp clothes on. Much stress has been laid upon this fact, particularly in relation to lung diseases. Nevertheless, this cannot be an important cause of lung diseases, for colliers are similarly exposed. Moreover, in England colliers never wash or change their clothes at the pit head, while Cornish miners invariably do so in a heated building (dry) provided on the mine. The effects of high underground temperatures on men and horses are certainly of considerable interest and economic importance, and we know from personal observations that in warm and moist air underground the body temperature often rises several degrees; but we can find nothing in the circumstances connected with the mode of occurrence of miners' phthisis to suggest that high underground temperatures are in any way connected with its causation."

Church writes on the immediate results of high temperatures and hot vapors, as absent-mindedness, dizziness, fainting, vomiting, and, as graver results insanity and death. His final conclusion is the following: "The casualties positively traceable to heat are therefore 12 per cent. of the whole. Probably the heat increases the bad effects of the powder fumes and natural gases, and by making repairs to the shafts more frequently necessary it indirectly adds to the occasions when disasters may occur. I also confess to the belief, which is not sustained by observations upon specific casualties, that some allowance must be made for a less active mental condition, a dulling of the faculties and a certain recklessness to which the heat sometimes goads the men. On the other hand, heat makes them more careful, except when under momentary impulses, and I have never seen American miners more careful of themselves than in these mines. On the whole, the good and bad effects of heat seem to nearly balance each other, and I think that an allowance of 5 per cent. for the casualties indirectly caused by heat would be sufficient."

No Permanent Ill Effects

The main facts brought out by these observers are that high temperatures and humidities cause, under some conditions, a notable rise in body temperature, that all the bodily organs with the exception of the stomach are stimulated, that prolonged exposure to such conditions undoubtedly lowers vitality, that intermittent exposure produces no permanent ill effects, that these conditions cannot be considered an important cause of lung diseases, and, lastly, that under abnormal conditions loss of mental control and serious bodily disturbances result.

Local physicians inform me that the average life of the Comstock miner approximates 25 years, and that the miners do not show any greater susceptibility to any particular disease than the residents of the town. I am acquainted with miners who have worked more or less continuously underground for 30 years, and who are still capable of doing a good day's work. Compared with miners of other districts the Virginia City miners may be said to be just as healthy, if not more so. The result is due in a large measure to the fact that the Virginia City miner observes certain precautions, and that the mine-managements provide the necessary facilities.

Miners are careful not to expose themselves to cold drafts, since they work stripped to the waist. On passing from a hot to a cold place a heavy coat is used to protect the heated body. Wet clothes are either removed before going to the surface, or trousers and coat worn over them. All miners take hot and cold showers after coming off shift. Frequent drinking, and the bathing of the hands, wrists, arms, and head in ice-water is resorted to in all hot workings, and undoubtedly serves to keep down the body temperature, while temporarily refreshing. Frequent rests are taken in special cooling-rooms, so placed in the workings as to receive the freshest and coolest air. In exceedingly hot workings cold water from a hose is turned upon the miner while at work.

The effect of the underground conditions upon the blood was made the subject of a preliminary study by Prof. P. Frandsen at my request. His conclusion, given tentatively, is that "the conditions in the deep workings of the Virginia City mines do not have any particularly detrimental effects upon the composition of the blood. It appears that the main permanent effect is an increased hemoglobin content of the individual red-blood corpuscles."

Effects on Efficiency

Conditions are not favorable for a study of the comparative efficiency of miners working under normal temperatures and under those in the lower levels of the Comstock. The following conclusions are the results of my underground experience:

(1) Moderately high temperatures, from 95 deg. to 105 deg. F., with moderate humidities from 50 to 70 per cent. relative humidity, and with air currents of velocities from 200 to 300 ft. per min., do not prevent efficient work nor are they particularly uncomfortable.

(2) A higher temperature, from 110 deg. to 115 deg., together with the same conditions as above, decreases efficiency to a considerable extent.

(3) A high temperature, from 110 deg. to 115 deg., with high humidity and a moderate velocity air current, very greatly impair the miners' efficiency, and a still higher air velocity, under the same conditions, renders workings more bearable, but miners cannot work very long at one time.

(4) A moderately high temperature, from 95 deg. to 105 deg., in a saturated atmosphere with no current, becomes very trying. Prolonged exposure with much exertion is dangerous.

(5) A moderate temperature, from 90 deg. to 98 deg., in saturated air currents of a velocity from 400 to 500 ft. per min., and with more or less vitiated air, are conditions which are very trying and give a low labor-efficiency. Vitiated air will impair labor efficiency to a greater extent than a high temperature.

Mineral Production of Japan

An official report recently issued gives the gold production of Japan for the six months ended June 30 at 49,711 oz., or $1,027,546. Silver output was 1,863,508 oz. The copper produced was 43,989,033 lb., and the iron made 23,902 long tons. There was a total of 19,340,063 lb. of sulphur mined. The petroleum obtained was 31,651,665 gal., and the coal mined was 6,445,959 tons.

The Development of Heavy Gravitation Stamps*

By H. S. Denny†

So much has been heard of the increased efficiency attaching to the corresponding increase in weight of the gravity stamp in the last few years, and so much of the data has emanated from the mines with which W. A. Caldecott is associated, that it is fitting he should have come forward with a pronouncement on this subject before the Institution of Mining and Metallurgy.

It may surely be taken as axiomatic that there is a critical point in the weight of a stamp which will satisfy all the contingent factors of capital outlay, operating cost, horsepower consumed, crushing efficiency, maintenance and repairs, short of which point or beyond which there will be losses in economy. Mr. Caldecott in his notes undertakes to show, not that he has established this critical point, but that the increases in weight already carried out have resulted in very appreciable improvements in economy.

Many Factors in the Problem

While I do not for a moment dispute this statement, I must say that a close scrutiny of Mr. Caldecott's paper does not appear to provide the data essential to the proper substantiation of his contentions. We are told that with 1605-lb. stamps 6.02 tons of ore were crushed per 24 hours, yielding a pulp product of which 11.66 per cent. remained on a 60-mesh screen. This is in itself not an extraordinary performance, but we are given to understand that the operating cost per ton crushed is less than that obtaining with lighter stamps, although in his summary of the advantages of heavy stamps Mr. Caldecott does not specifically make this claim. I take it, however, that as the whole question is purely one of ultimate economy, Mr. Caldecott means it to be understood emphatically that the results obtained from the 1605-lb. stamps do show a great economic improvement over the 1250-lb. stamps.

The mere facts that there is a reduction in the size of the mill building, that 30 per cent. less shafting and other moving parts are needed and that less labor is required, do not in themselves constitute a final and convincing case for the heavy stamp. There are a great many other things that form important counters in such a computation, and from my point of view I would like to see Mr. Caldecott's statements supported by supplementary figures in which the following points would be dealt with:

(1) Comparative statements of capital cost of a 1250-lb.-stamp battery as compared with a 1600-lb.-stamp battery of equal capacity, complete. The number of gravity stamps in the respective batteries would remain the same, while the cost of fine crushers for the lighter stamps would of necessity come into this statement.

(2) A power curve illustrating the fluctuating efficiency of the respective batteries on varying numbers of stamps running; together with a statement of the actual consumption of power per ton of ore crushed and a grading analysis of the pulp produced.

(3) Data as to the comparative time and labor involved in carrying out repairs to either battery, taking into consideration the heavier units of the bigger mill.

(4) A statement showing the comparative effect of loss of time in hanging up a battery of the heavy stamp as compared with lighter ones.

(5) A general statement showing that the advantage still lies with the heavier stamps taking the lives of the respective batteries into consideration, and taking into account the initial capital outlay with redemption and interest charges properly apportioned, and figuring on the respective capacities of the two mills on equal products, and finally calculating in all those other factors of time and labor interwoven in the question.

It must not be forgotten that the framing, foundation, driving gear and component moving parts must all be correspondingly heavier and more expensive, and renewal units more unwieldly; while we can readily grant that these points are of minor importance, they must not be entirely overlooked.

Two points of the greatest importance that have always been a subject of discussion and which are fraught with the greatest bearing on the capacity of the gravity stamp, are the size of the ore being fed into the mill and the coarseness of the screens used for the discharge. If the stamp mill is asked to do the work of either the stone breaker or the grinding machine, that work will be done at an economic disadvantage as there are other machines in which these two operations can be much more efficiently carried out.

Preliminary Crushing Advantageous

Mr. Caldecott says "fine breaking before milling on heavy stamps does little good," and I must confess that the figures in column B on his first table rather surprises me. Of course it is clear that with the heavier stamp it would not be economic to resort to so fine a preliminary crushing as that found most profitable with the 1050-lb. stamp, but I was not prepared to find that all the advantage disappeared when the weight of the stamp was increased to 1342 lb. According to Mr. Caldecott's figures the duty per stamp per 24 hours with equal weights of stamps was higher in the case where 54.3 per cent. of the material remained on a 1⅜-in. screen than in the case where only 1.1 per cent. of the material remained on the same screen. This result seems most extraordinary and, in order to show how remarkable it is, I herewith append some results obtained from a Rand mill by virtue of the interpolation of a fine-grinding plant between the coarse crushers and the battery.

The primary object of the installation of the fine-crushing plant on this mine was to permit of the mill being overhauled, 20 stamps at a time, without interfering seriously with the output per month. Two small jaw crushers, electrically driven and designed to reduce the ore from 2½ to 1½ in., were installed. It became quite evident after the first few days' work that the introduction of this plant was to have the desired effect. The plates and launders banked up with the additional material, and it was found necessary to make alterations to the mill water service before the increased quantity of ore crushed in the mill could be properly handled. Without the fine breakers the mill duty on 400-mesh screens averaged under 5 tons per stamp per day. After the installation of the fine breakers the duty increased to 5.6 tons per stamp per day, equivalent to a 12 per cent. increase. The figures were calculated carefully and may be taken as accurate. The average cost of milling under ordinary conditions over a period amounted to 2s. 11.657d. With the fine-breaker plant the average was 2s. 11.177d., a reduction of 0.48d. per ton milled. The objects of the installation of the plant were achieved most successfully; and the whole mill was rehabilitated without prejudice to the monthly returns.

These figures were all carefully compiled and the results were so satisfactory as to leave no room for doubt regarding the efficacy of fine crushing when used in conjunction with light stamps. It may be argued, however, that the ore was in any case being fed in too coarse a condition to the mill, and I think that when Mr. Caldecott says "hence the heavier the stamp the coarser the preliminary breaking admissible, and *vice versa*" he has hit the real truth. *"Vice versa"* would then read: The lighter the stamps the finer the preliminary breaking admissible.

To follow this statement to its logical deduction, we find then that as Mr. Caldecott believes in the use of fine crushers with a light stamp, he must

*Discussion of a paper by W. A. Caldecott in *Bull.* I. M. M., Aug. 12, 1909, an abstract of which appeared in Eng. and Min. Journ., Sept. 25, 1909.

†Mining and metallurgical engineer, Gante 1, Mexico, D. F.

further believe that the use of the heavy stamp will do the same work that the crushers are designed to do for the lighter stamp and more economically. It appears to me that much of the problem lies in this point, and personally I have the feeling that the limitation of the weight of the stamp will be met at the line of demarcation between the crusher and the stamp-mill principle. It is difficult to imagine that ore can be reduced from 2½ to 1½ in. as efficiently and economically in a stamp mill as in a jaw or toggle breaker, because in the one instance we have anything but a positive discharge and positive feed, while in the other we have both of these points well defined; and furthermore, the power consumption in the case of the crusher is in direct ratio to the work performed, while in the case of the gravity stamp it is not necessarily so.

Further Investigation Advised

I have made special reference to this matter because a reader of Mr. Caldecott's remarks might unwittingly get the impression that Mr. Caldecott intended to say that preliminary fine crushing was in no case necessary; but this is not so, and as there are many remote places where moderately light stamps will still be used on account of great transport difficulties, the value of a preliminary fine crushing should not be lost sight of, even from his point of view.

Mr. Caldecott makes no reference to the high-speed stamps of the Morrison type installed and run on the Meyer & Charlton mine for many months in 1903. These stamps had a weight of over 1600 lb., and owing to their being operated by a crank shaft, it was possible to run them at as high as 135 blows. They registered a duty of over 9 tons per stamp per day for a considerable period. It was quite clear that the increased weight was resulting in a more than proportionate increased duty, but there were other considerations that prevented us from arriving at any settled conclusion in the matter.

Mr. Caldecott says "it will be evident the day of the stamp as a unit of crushing capacity has passed away," and in this everybody will agree with him for the reason he has stated. Whether or not the principle of the gravity stamp will ever be discarded universally is doubtful, but I do know that many attempts have been made in small plants to discard it, and with the greatest success; that is to say, there are numbers of plants in the United States today in which the stamp mill finds no place. The principle followed is coarse crushing, fine crushing, edge runners and tube mills, and when considered from the all important aspects of capital outlay and operating costs, it has been proved in more than one case that the stamp mill is not absolutely indispensable. So far, however, the results have been obtained only from small plants, and I know of no case in which the engineer has had the temerity to lay out a large-capacity plant without the gravity stamp.

In conclusion, I think that Mr. Caldecott, now that he has begun on the ventilation of this important matter, would do a great service if he continued the subject in some of these more practical directions which I have indicated in these remarks, and as he is well placed to carry out the necessary investigation work it is just and fit that he should continue the good work begun. I would suggest, however, if the result of increasing the weight of stamps is merely to do the work which could be done by the crusher in conjunction with the lighter stamp—and this is what in effect Mr. Caldecott claims—then the matter requires grave consideration before going further, for I personally am not fully satisfied as to the wisdom of such a step. Until further details are available, I do not consider that we should be justified in assuming that the heavy stamp is an unmitigated good.

The Classification of Patents

Special Correspondence

The reclassification of patents (contrary to reports appearing in the daily press) which is now in progress at the United States Patent Office is not a new undertaking, although it has been advanced rather more rapidly of late. Several years will probably be required to finish the work unless Congress should make more liberal appropriations for the support of the scheme. This latter is much to be desired, as the work will, according to expectations of competent men, do away with two-thirds of the difficulty of searching patents, and to a corresponding extent will tend to lighten the burden of expense resting upon inventors.

The number of patents now in existence at the Patent Office is nearly 3,000,000, of which 2,000,000 or more are foreign and 900,000 or more are American. These patents have always been classified in some way, inasmuch as only by some such method could any order be maintained or any searching of patents be rendered possible. The various classes of patents, however, have always had a tendency to grow and this growth has frequently been in unforeseen directions. Probably the year 1884 is the last date in which the old classification could be said to be up to date. Subsequent to that time, the constantly increasing pressure of work in the office rendered it practically impossible to keep up examinations of cases, and at the same time maintain the classification in proper condition. As a result of the smallness of the force and of the difficulty of the situation, many lines got behind and the confusion tended to increase.

Some years ago a classification examiner was appointed in accordance with an act of Congress, and after looking into the problem he recommended certain lines of reclassification of patents, and undertook the work. The original plan of the work was to class the various patents by mechanisms rather than by the purpose of the invention, and this is the plan that, with some minor modifications, is now being pursued. For example, a punching machine may be either a machine for punching metal or for punching paper. Under the old classification it would have been placed, in the former case, under metal-working machinery, and in the latter under machinery for manipulating paper. The present idea would be to place all punching machines together in one class. The results of the classification so far as it is accomplished are being put out from time to time in bulletins, which exhibit the changes that are actually introduced. A systematic general grouping is, of course, being sought as against the present unsatisfactory and unsystematic method. There are now about 250 classes of patents and from 6 to 350 subclasses in each group. The new grouping will not only develop a better arrangement, but will seek to balance the subclasses as evenly as possible. More subclasses and subdivisions are being created to the end that patents in any particular line may be reached more easily. In general, in establishing the new subclasses, the object sought is to get together into a single subclassification all devices relating to any one feature of a given invention. Thus under the general class "gas engines" one distinct subclassification will be "spark plugs." Probably not more than 100 patents ought to figure in any subclass, if it is possible to maintain the grouping with that limitation.

Patent attorneys regard the progress of this work with much favor, inasmuch as it will relieve an extremely difficult situation and will make it possible for them to carry on their work with much greater accuracy and assurance than at present.

Value of Tantalum Ore

English dealers quote as follows: For ferro-tantalum of 65 to 75 per cent. Ta, 14s. per lb. of tantalum contained; tantalum ore of about 60 per cent. Ta, 205@ 220s. per 112 lb., on a basis of 60 per cent. Ta at 205 shillings.

The camps of Miami, Baxter-Quapaw, Peoria, Spring City and Granby in the Missouri-Kansas-Oklahoma zinc-lead district are to be supplied with fuel gas. A 16-in. main is now being laid from the Kansas gasfields.

Sinking Concrete Shafts in Quicksand

In Water-bearing Alluvium Rapidity of Sinking Exceeds Other Methods. Concrete Walls Are Fireproof and Permanent; Pumping Expense Reduced

BY FREDERICK W. ADGATE*

The Cleveland-Cliffs Iron Mining Company in the spring of 1907 made preparations to sink in the Swanzy district near Princeton, Mich., a timber drop shaft, to be called the Smith shaft. Knowing the ground to be saturated with water, it was thought advisable to make a few tests to arrive at the quantity or flow of water in the overburden at this site. Accordingly several 6-in. pipes perforated most of their length were sunk a number of feet into the ground at the proposed site of the shaft, and two special Cameron pumps, with 10-in. steam end and 12½-in. water end were connected to some of these pipes. Pumping was then started and continued for some time, a careful observation being made of the hight of the water in one of the pipes which was not connected to the pumps being open for this purpose.

Continuous pumping lowered the level of the water so little that the mining company concluded that it would be a difficult operation to sink a shaft by the ordinary drop-shaft methods, and in the autumn of 1907 a contract was entered into with the Foundation Company of New York (a company which makes a specialty of sinking difficult shafts and doing other foundation work) for a reinforced concrete shaft of rectangular cross section the dimensions of which would be 15 ft. 4 in. by 11 ft. 4 in. inside.

*Western manager, Foundation Company of New York, The Rookery, Chicago.

NOTE—Paper read at the Marquette range meeting of the Lake Superior Mining Institute.

PNEUMATIC-CAISSON METHOD

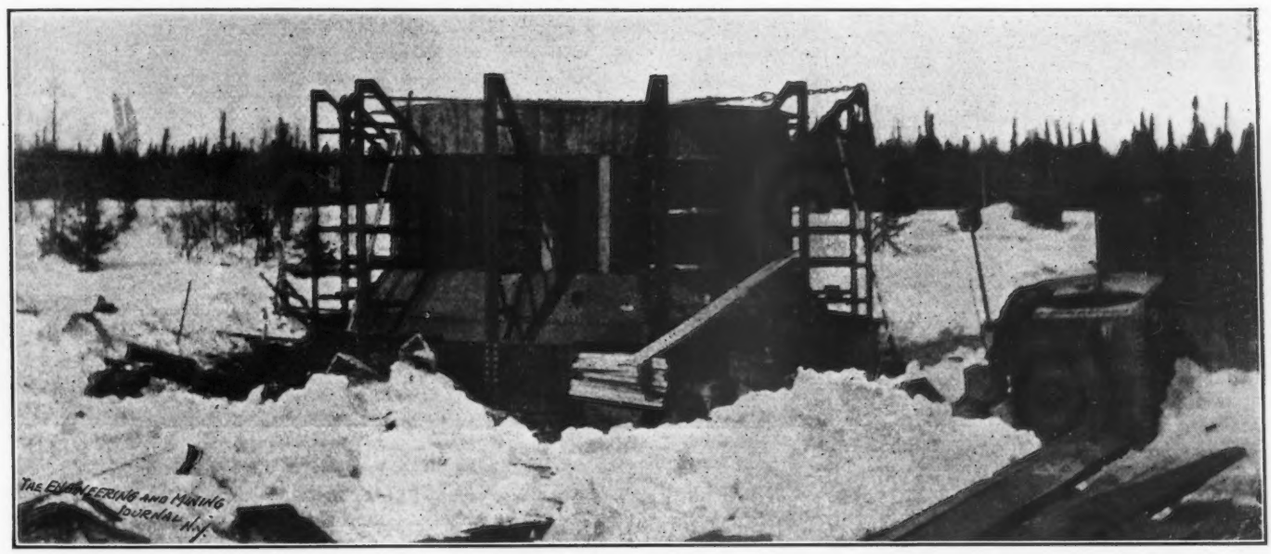
After an examination of the site and a study of the diamond drill borings, which showed about 60 ft. of water bearing overburden made up of quicksand, gravel and boulders, the Foundation Company decided to use the pneumatic-caisson or compressed-air system in sinking this shaft.

The use of compressed air in subaqueous excavations has been exemplified, and engineers have become familiar with it, by the construction of bridge piers, tunnels and building foundations, but it was first applied to shaft sinking by the engineers of the Foundation Company. To make this application successful, special devices, plans and equipment had to be thought out, tried and perfected before beginning the operation. By reason of its extended operations and wide experience, the Foundation Company was in a position to guarantee to a client a water-tight, indestructible, fireproof and plumb shaft.

Plans were submitted and accepted for a reinforced-concrete shaft to be sunk by the pneumatic process. The contract allowed 90 days for completion, and the specifications required that the shaft should be carried down plumb and water-tight, and that when solid rock was reached, a water-tight joint should be effected between the shaft and the rock.

In dimensions the shaft was 21 ft. 4 in. x 17 ft. 4 in. outside, with walls 3 ft. thick at the bottom and 1 ft. 6 in. at the top. The concrete was started on top of a timber shoe or cutting edge, which consisted of two layers of 12x12-in. fir timber, beveled on the inside, the bottom stick being shod with a heavy angle iron, and the whole strongly bolted horizontally and vertically, tying all the timber firmly together. The walls were of concrete strongly reinforced with 1¼-in. and 1-in. square steel bars, spaced 6 to 8 in. vertically and about 18 in. horizontally.

The horizontal reinforcement was designed to take the earth and water pressures, while the vertical rods mainly prevented the lower sections of the walls from pulling away from those above during sinking operations. These vertical rods passed down through the timber cutting edge, anchoring same to the concrete walls.



VIEW OF A CIRCULAR CAISSON WITH CUTTING EDGE—IN COURSE OF CONSTRUCTION

THE WORKING CHAMBER

Six feet above this cutting edge and notched into the concrete wall was the deck, or roof of what is familiarly called the working chamber. It is of course necessary in using the pneumatic process to confine the air to make its use effective. This is accomplished in shaft work by building a roof or cover over the inside of the shaft, strong enough to withstand and hold any required air pressure. This roof or deck as it is technically called, may be situated at a point near the bottom of the shaft or higher up as convenience may dictate.

The deck of the Smith shaft was built

of 12x12-in. timbers strongly bolted together and further bolted to the concrete walls at the sides where the deck fitted into the notch in the concrete. These side bolts assisted in taking care of the uplift due to the compressed air on the under side of the deck. After the shaft was on the rock and a tight joint made, the air pressure was removed, and then, owing to the manner in which the deck was notched into the walls, it was readily pulled out, and the notch concreted flush with the walls.

In the center of the shaft and bolted to the upper side of the deck was the steel man and material shaft, which consists of a number of ½-in. steel sections, 48 in. diameter, bolted together with vertical steps or ladders bolted to the inside and extending from the deck to the surface of the ground. The 48-in. steel cylinder is surrounded by an air lock, called the Moran lock, which was devised and patented by D. E. Moran, one of the members of the Foundation Company. A hole, 3 ft. in diameter, was cut in the timber deck, which established a communication between the working chamber below the deck to the man and material shaft above the deck.

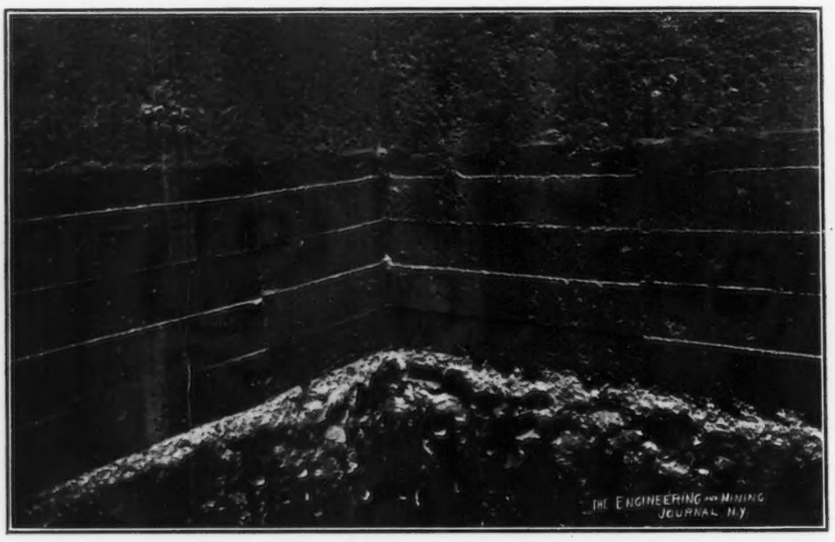
Sinking the Caisson

Work was started on the shaft Sept. 1, but owing to the unprecedented industrial activity at that time, it was impossible to get construction material, and it was not until Nov. 7 that active sinking operations began. The cutting edge was first assembled at the surface of the ground and the inside forms for the first 10 ft. built on top. All other forms were built apart from the shaft in sections 6 ft. high and of interchangeable design. The form material was 2x8 in., tongued-and-grooved plank. After the forms had been placed and concreted a hight of about 18 ft., sinking without air was resorted to until water was encountered, which occurred at a depth of about 5 ft. from the surface. Air was then pumped into the working chamber and when the water in the working chamber had been displaced by air, gangs were sent into the shaft, and excavating began.

The material was shoveled into a circular bucket and then hoisted up through the man and material shaft and air lock to the surface. The bucket was then dumped into small cars and the material removed to a point some distance from the shaft, where it was used to level up the ground, the bucket returning to the working chamber for another load. On account of the slow-setting qualities of the cement, only one gang of men was required to excavate from 4 p. m. to midnight, in order to keep apace of the erection of forms and concreting which was done during the day.

An ordinary contractor's derrick, operated by a special three-drum steam hoist, was used to handle the excavating buckets, erect the concrete forms and deposit the concrete in the walls. It was endeavored to keep the shaft lining built up above the ground at least 18 ft. all the time to permit the use of three sections of concrete forms, the lower set of forms being moved up when it reached the ground, as a result of the removal of material from the interior of the shaft and from under the cutting edge.

The shaft lining sank of its own weight until it had reached a depth of approximately 40 ft., when it became necessary to apply additional weight. The only available weight that could be procured at that time was wet sand. This was loaded upon the deck in the interior of the shaft and more added from time to time. In this manner the shaft went down steadily until it reached the rock formation on Dec. 7, exactly one month from the time air was first applied. The rock was first encountered in one corner of the shaft and proved to have an inclination of 3 ft. 6 in. in 20 ft. In order to make a water tight joint, it was necessary to level off this rock and then go down about two feet further in order to get below a seam in the rock. This rock excavation was all accomplished under air pressure. Blasting was resorted to as in ordinary open excavations; however, particular care and knowledge must be exercised to get successful results under these conditions. The rock excavation was completed Jan. 5, 1908.



JUNCTION OF CONCRETE LINING OF SMITH SHAFT WITH ROCK

Completing the Shaft

The inside top timber comprising part of the cutting edge was then removed and the walls concreted to the rock, thus presenting a solid masonry face from the rock to surface. This joint was tied to the rock with steel dowels and to the walls above by means of projecting bolts, which had previously held that part of the cutting edge taken out and replaced by concrete. Air pressure was maintained on the shaft for three days after the completion of the joint to allow the concrete forming the joint ample time to set before subjecting it to the outside water pressure. The air pressure was then gradually reduced to zero. Subsequent inspections showed that the shaft developed an accumulation of about 6 in. of water (650 gallons) in 24 hours, most of it coming through the rock. Absolutely no water, not even a seepage, was discernable through the joint. This was all that could be anticipated or hoped for, and I have since been informed that most of the leaks have stopped.

Near the collar of the shaft, an opening 7 ft. in hight by 8 ft. 8 in. in width was left in the southeast wall from which was constructed a concrete tunnel running horizontally, at right angles to the shaft. This eventually will communicate directly with the cage and ladder ways and was placed at such an elevation as to pass beneath the standard-gage tracks which will handle the ore. This tunnel has side walls and roof 18 in. in thickness, is rectangular in cross section, its length is 34 ft. 6 in. The side walls and roof, directly under where the ore trains pass, were reinforced with plain steel bars but the greater part of the roof was reinforced with 1⅛-in. steel cable which was found conveniently at hand.

After sinking operations were completed, and the temporary weight of wet sand together with the deck, was removed, holes were drilled into the walls and heavy cast-iron brackets bolted against the same. These brackets carry horizontal channel irons dividing the shaft into compartments for skips, cage and a pipe and ladder way. It is futher proposed to sheath these compartments with corrugated iron or similar fireproof material.

Kidder Shaft

After the successful completion of the Smith shaft, the Cleveland-Cliffs Iron Company entered into another contract with the Foundation Company to sink the Kidder shaft, which is situated in the same district and within half a mile of the Smith shaft. Here the conditions are somewhat different. The general character of the overburden is the same, but deeper, and the ledge is more broken up and seamy. It was decided that a circular shaft was best adapted to this particular site.

Plans were accordingly drawn for a reinforced concrete structure of a circular cross-section, being 24 ft. in outside diameter and having an inside diameter large enough to provide a rectangular space 14 ft. 10 in. x 10 ft. 10 in. The walls of the shaft were built upon a fabricated steel shoe, being 24 ft. in outside diameter, where it is riveted to a steel cone plate on the inside, the slope of which extends to a hight of 10 ft., making the working chamber or caisson conical in shape. There is a circular opening, 10 ft. in diameter, at the top of the chamber or cone, to which is bolted steel sections, 10 ft. in diameter, which are carried up section by section as the structure sinks, and through which was operated a clam-shell dredge bucket. This dredging cylinder also acted as a wall of the caisson while sinking operations were conducted by the pneumatic process.

Method of Sinking

The general plan of sinking the Kidder shaft was as follows: The shaft lining was built up to a hight of about 15 ft., and two sections of the dredging cylinder connected to the top of the cone plates; a clam-shell bucket was then lowered through the 10-ft. dredging shaft to the bottom, where digging operations began. As the clam-shell displaced the material, the shaft settled by its own weight. Care had to be taken to build on the top fast enough to always keep the top of the structure several feet above the surface. This plan of sinking was followed until the shaft had reached a depth of 87 ft., where a stratum of very hard clay was discovered which the dredge refused to handle.

A steel deck or roof was then bolted to the top of the dredging shaft. This deck in turn supported a Moran air-lock, and the shaft was now equipped for compressed air operations, which were immediately begun and the shaft carried down to rock, which was found 104 ft. from the surface. The formation was so broken up and seamy that it was found necessary to continue the shaft 9 ft. into the rock, making a total excavation of 113 ft. from the bottom to the collar of the shaft, or 103 ft. below water level.

The Shoe

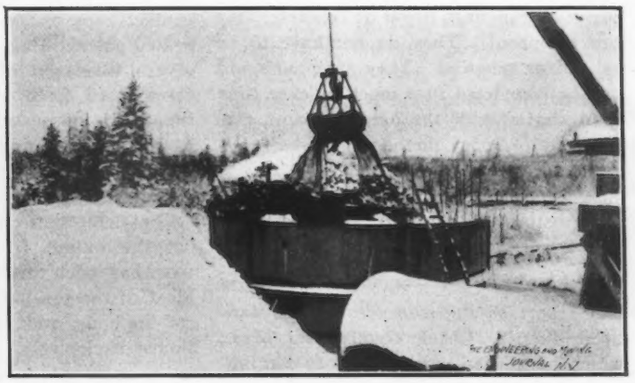
The cutting edge or shoe, the inside of which forms the conical space at the bottom of the shaft, deserves further mention. It weighs approximately 40,000 lb. and is made in three horizontal sections, each section being made up of 12 plates of ½-in. steel, joined to the succeeding section by a lap-riveted joint. On the outside of the bottom, there is a steel plate, 30 in. high by ⅝ in. thick, that forms the base of the cylinder and the outside form of the wall of the shaft to which the steel brackets and plates which form the cone are attached. The angle, or slope of the cone on the inside, with the outside of the shaft, is made the shape of the brackets. This slope is the ratio of 7:10, or about 40 deg. The brackets are riveted to the heavy outside plate and to all the plates forming the cone. There are twelve of these brackets, and they are made in two parts bolted together so that one part is readily detachable from that part of the steel work which necessarily remains in the concrete and forms part of the permanent wall.

Concrete Forms

In the construction of the walls of the shaft, two sets of forms were used, one on the outside and one on the inside. The outside form is made of three sections, 5 ft. high and 24 ft. in diameter. Each section is in turn made up of 6 plates of ½-in. steel bent to a 12-ft. radius on the inside; on all four sides of these plates, 4-in. angles are riveted to make the necessary connections to make the circle and also to connect the sections one to the other to make the wall continuous, proper bolt holes being punched at certain intervals in the angles to make this possible. The inside forms were also made in three sections, each section being constructed from 2x6-in. tongued-and-grooved pine held together by three sets of 4x4x½-in. angles bent to the radius that will give the necessary thickness of the wall at the various depths of the shaft.

The thickness of the walls of the shaft varies, of course, with the depth the shaft has to go and the pressures that will come on the wall. In the case of the Kidder shaft, the wall at the top is 2 ft. thick, down to a depth of 17 ft. It is there increased to 2 ft. 6 in. to a depth of 50 ft., then increased to a 3-ft. wall at this point and carried to a depth of 82 ft. and is there increased to 3 ft. 6 in. and carried with that thickness to the bottom.

ECCENTRIC LOADING DURING SINKING



DREDGE BUCKET IN OPERATION

Details of Kidder Shaft

The Kidder shaft was strengthened by a system of reinforcing steel placed in a similar manner to that described in the Smith shaft. In order to sink the Kidder shaft to the depth it finally went, it was necessary to use 375 tons of pig iron over and above the weight of the structure itself in order to overcome the excess of friction encountered and the upward pressure of the compressed air.

At a point 87 ft. below the surface a very hard stratum of clay about 2 ft. thick was encountered. After dredging some hours, without much success, the clay was penetrated at one point only and the quicksand which underlies the strata of clay started to run into the interior of the shaft, causing a run-in or slump of the ground on the outside of the shaft at one point only, which extended to the surface and threw the shaft about 6 in. out of plumb. Dredging was then abandoned and

the shaft equipped to carry on further sinking operations by the pneumatic process. This method was used until the completion of the shaft. When the shaft had been sunk into the rock about 9 ft., a concrete joint was constructed similar to that described in the Smith shaft.

Work was started on the Kidder shaft on Aug. 15, 1908, and completed Jan. 15, 1909. The maximum air pressure used on the Kidder shaft was 45 lb. above atmosphere. This is about the limit of human endurance and very dangerous to the men employed inside the shaft. At the greatest depth, two shifts of 40 min. each, constituted a day's work, and while no fatal effects followed, three of the men are to-day suffering from partial paralysis and will never wholly recover from its effects.

The Smith and Kidder shafts are typical of the advanced methods of shaft sinking through water-bearing ground which are being carried on in this country to-day. The advantages these shafts possess over the old style timber drop shaft are obvious and many. First, they shut off all surface water—doing away with the expense of pumping. Being of concrete, they are fire-proof. They do not have to be relined or renewed. They are plumb and can be completed in a much quicker time than shafts sunk through the same material by ordinary methods.

Deposits of Iron Ore near Hanover, New Mexico

A report on the iron ores of the Hanover district, Grant county, N. Mex., which have been worked almost continuously since 1899, has been published by the United States Geological Survey, forming a chapter in *Bulletin* 380. The report is based on a reconnaissance of the district by Sidney Paige, one of the Survey geologists, who discusses the geology of the district and gives analyses of the ores and statistics of production.

Topography

The Hanover area is within the mountainous region lying between Gila river on the north, the desert on the south, and Mimbres river on the east. It is drained by a southward-flowing stream with many mountain tributaries, which in times of heavy rainfall becomes a raging torrent, but whose waters after passing beyond the mountain border are lost in the desert sands. This stream carries a large amount of detrital material and the general lack of trees and shrubs facilitates the work of denudation.

Geology

The geological relations are fairly simple. A mass of igneous rock (quartz-diorite-porphyry) has intruded limestone and other sediments of Carboniferous age. In a part of the area the intrusion has caused extensive metamorphism of the sedimentary rocks, and along the contact zone ores of iron, copper and zinc have been deposited. The iron ore is principally magnetite, but at one place there is some hematite. The metamorphism is not confined to the intruded rocks, as the diorite-porphyry has suffered similar changes, though to a less degree.

The Ores

The iron ores comprise both hard and soft ores. Of the former there are three large lenticular masses and numerous outcrops that appear to have the same mode of occurrence. The soft ore occurs at several places along the contact between the igneous and sedimentary rocks. The iron content is estimated by Mr. Paige to average between 53 and 57 per cent. The following theory of the genesis of the ores is tentatively presented: "On coming to place, the heated magma, by solutions probably above the critical temperature of water, impregnated certain strata of the surrounding rocks. Adjustments, due to cooling of the porphyry, to possible volume changes in the intruded sediments, and to gravity, served to make of the contact zone a favorable locus of superheated gases. Magnetite, a mineral which several investigators have shown might be precipitated from iron silicates by reactions with lime, collected, replacing limestone, filling openings that may have gradually grown and replacing in part the porphyry mass."

Complete statistics are not available, but the output from this district since 1900 has been over 1,000,000 long tons. Most of the ore has been mined by open-cut methods, and Mexican labor is used almost exclusively.

Radium in Austria

The work at the Imperial Austrian radium factory is described by American Consul Will L. Lowrie. The factory is situated at St. Joachimsthal and has produced over $500,000 worth of radium chloride (13 grams at $45,000 to $50,000 per gram). It is extracted from pitchblende by repeated reductions. The pitchblende is taken from a worked-out silver mine near Joachimsthal, about 12 miles northwest of Carlsbad.

The government employs about 100 men at the mine, working the pitchblende chiefly for its uranium content. The radium factory is operated largely for experimental purposes. It requires approximately 10 tons of pitchblende to yield 1 gram of radium bromide, which is contained in the residue after the uranium is extracted. In the process 11,000 lb. of chemicals and 110,000 lb. of water are employed. To obtain the radium more than a thousand crystallizations and reductions have been made at the factory. These require from a few hours to several days each, becoming more difficult the nearer the approach to the radium chloride.

Plans have been prepared for a large bathing establishment at St. Joachimsthal, where baths may be taken in the radioactive water from the mine.

Geology and Ore Deposits of Goldfield, Nevada

The United States Geological Survey recently published a monograph entitled "The Geology and Ore Deposits of Goldfield, Nevada," by Frederick Leslie Ransome. The geologic structure of Goldfield is simple. The district is essentially a low, domical uplift of Tertiary lavas and lake sediments resting upon a foundation of ancient granitic and metamorphic rocks. The erosion of this flat dome has exposed the pre-Tertiary rocks at a number of places in the central part of the district and these outcrops are surrounded by wide concentric zones of successively younger formations.

The most notable features of the orebodies are their remarkable richness and their equally remarkable irregularity. The ores are almost without exception associated with craggy outcrops of silicified volcanic rock. Associated with the silicification other processes of locally intense alteration, especially the formation of alunite, have also been active. The deposits have formed along zones of fissuring, which for the most part are very irregular in trend.

Oxidized ores have supplied a large part of the gold produced during the first two or three years of exploitation, and in some mines no sulphide ores are yet known. The sulphide ores are of complex mineralogical character, native gold and pyrite being accompanied by minerals containing copper, silver, antimony, arsenic, bismuth, tellurium and other elements. A concentric crustification is characteristic of the richer ores, fragments of altered rock being covered by shells of gold and sulphides.

According to Ransome, the intimate association of unusually rich gold ores with the mineral alunite is the most remarkable feature of the deposits and proves that the ores were deposited from solutions containing sulphuric acid. Several hypotheses have been advanced to account for this acidity. The theory favored by Ransome postulates that the ore constitutents were brought up in hot solutions charged with hydrogen sulphide, a little carbon dioxide, and probably also some alkali sulphides; that the hydrogen sulphide was oxidized at and near the surface to sulphuric acid, which percolated down through the warm rocks to mingle with the uprising currents carrying sulphydric acid; and that the precipitation of the richest ores took place in the zone where the two kinds of solutions mingled and as a consequence of such mingling.

Compressed Air Calculation Short Cuts

A Chart by Which M. E. P. and Horsepower May Be Determined without Use of Complicated Formulas Involving Fractional Exponents

BY SNOWDEN B. REDFIELD

The accompanying diagram was calculated by Ward Raymond, assistant chief engineer at the Phillipsburg, N. J., plant of the Ingersoll-Rand Company. By the use of this diagram the calculations of the adiabatic mean effective pressure and indicated horsepower developed by the compression of air are reduced to their simplest possible terms.

In this diagram we have the solution of the expression

$$M\ E\ P = 3.46\ P_1\ (R^{0.29} - 1).$$

$M\ E\ P$ refers to mean effective pressure developed in the air cylinders; P_1 is the absolute initial pressure, which in the case of an air compressor is usually atmospheric; R is the ratio of compression, or the absolute discharge pressure divided by the absolute initial pressure. Owing to the fact that this formula contains a decimal exponent, namely, the 0.29 power, it is rather unwieldy, and many people shrink from using it any oftener than they can possibly help. Knowing the value of R from the conditions of the problem, we find directly from the diagram the corresponding value of the rest of the expression, namely, 3.46 ($R^{0.29}$ — 1), and multipying this factor by the absolute initial pressure, gives the mean effective pressure right away. The four following examples will serve to show the simplicity of the operation:

Single-Stage Compression

Assume single-stage compression from the atmosphere to 60 lb. gage pressure. R, the ratio of compression, will be (60 + 14.7) ÷ 14.7, or 74.7 ÷ 14.7 = 5.08. Examining the diagram we find that the vertical line marked A corresponds to the value of R = 5.08. From the curve at this point we find that the value of the factor for which we are looking is 2.082. In the case of the problem the initial pressure is atmospheric, or 14.7 lb. per sq.in. absolute. Multiplying 2.082 by 14.7 we have a mean effective pressure developed in the air-compressor cylinder of 30.6 lb. per sq.in., based on adiabatic compression. This is the true theoretical adiabatic $M\ E\ P$ exerted against the piston and it is not necessary to deduct the back pressure from this as in the case of the usual steam formula.

In most compressed-air problems the mean effective pressure is not wanted so often as the indicated horsepower per 100 cu.ft. piston displacement per min., and in all cases this can be found by dividing the mean effective pressure by 2.29. For the case in point, dividing 30.6 by 2.29, we have 13.4 indicated horsepower developed in the air cylinder per 100 cu. ft. of piston displacement per min. Dividing this by 100 and multiplying by the piston displacement per min. of the compressor, we have the total indicated horsepower in the air cylinder in question.

If the compression had been single-stage from atmosphere to 100 lb. the value of R would be

$$114.7 \div 14.7 = 7.81.$$

In looking at the diagram we find that the vertical line corresponding to R = 7.81, crosses the line of the diagram at the point marked B corresponding to a value of the factor 2.82. Multiplying this number by the initial pressure 14.7 lb absolute, we have an answer of 41.4 lb. per square inch $M\ E\ P$ developed in the air cylinder. Again, dividing this by 2.29 we have 18.1 indicated horsepower developed per 100 cu.ft. of piston displacement per minute.

Compound Compression

For compound compression all we have to do is to remember that with theoretical conditions the horsepower of the low-pressure and the high-pressure cylinders should be alike, giving the minimum total power developed. In practice air compressors are designed so that this is approximately true. The curves and all the formulas are, of course, based on the theoretical adiabatic, and, therefore, we are correct in assuming that the horsepowers in each of the two stages of compression are alike. If the horsepowers are alike this means that the ratios of compression in the two stages are also alike, and consequently the ratio of compression in each cylinder for compound compression will be the square root of the total ratio of compression.

From atmosphere to 100 lb. pressure we have already found that the total ratio of compression is 7.81. The square root of this or the ratio of compression in either the low-pressure or the high-pressure cylinder is 2.8. Entering the diagram we find that the line corresponding to the value of R = 2.8 crosses the factor line in the diagram at the point marked C and corresponds to the value of the factor 1.204. Multiplying 1.204 by the initial pressure 14.7, we have the mean effective pressure in the low-pressure cylinder 17.7 lb. per sq.in. Dividing 17.7 by 2.29, we have the power in the low-pressure cylinder 7.73 indicated horsepower per 100 cu.ft. of displacement of this low-pressure cylinder. As this must be half of the total compressor horsepower of the compound compression, we have 15.46 indicated horsepower total for the two stages per 100 cu. ft. of displacement per min. Dividing this by 100 and multiplying by the low-pressure cylinder displacement in cu.ft. per min. we would have the indicated horsepower of the compressor in question.

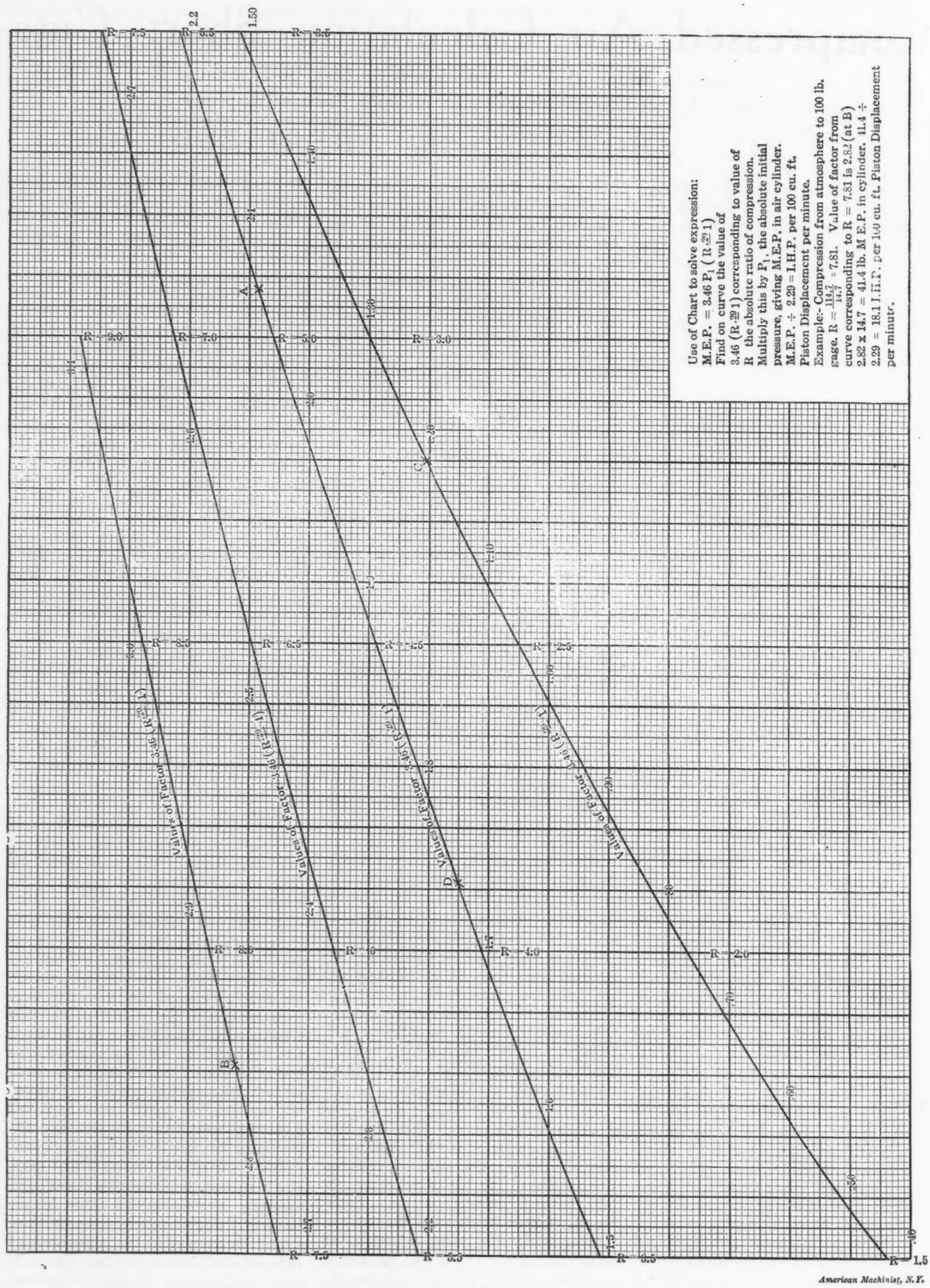
This process may be carried through three, four, five or any number of stages of compression. All that needs to be remembered is that for multiple-stage compression the horsepower in all the cylinders is supposed to be alike; therefore finding the horsepower in the low-pressure cylinder we can multiply this by the number of stages or cylinders, giving us the total horsepower of the compressor. In order that the horsepowers shall be alike, the ratios of compression in the various stages must be alike and consequently for compound compression, must be equal to the square root; for three-stage the cube root and for four-stage the fourth root of the total ratio of compression.

Three-Stage Compression

4. Assume three-stage compression to 1000 lb. pressure. The value of R, the ratio of compression, will be 1014.7 divided by 14.7 or 69.2 compressions. With equal horsepower in each stage the ratio of compression in each stage and consequently in the low-pressure cylinder, will be the cube root of 69.2, or 4.11, and in the diagram we find that the value of R corresponding to 4.11 is marked D. This corresponds to the value of the factor of 1.75. Multiplying 1.75 by 14.7 we have 25.7 lb. per sq.in. mean effective pressure in the low-pressure cylinder. Dividing this by 2.29 we have 11.22 indicated horsepower per 100 cu.ft. per min. displacement of the low-pressure cylinder.

This is the horsepower in the first stage, also in each of the succeeding stages; consequently multiplying this figure by the number of stages, namely, three, we have a total horsepower of the compressor of 33.7 indicated horsepower per 100 cu.ft. piston displacement of the low-pressure cylinder of the compressor per min. This divided by 100 and multiplied by the pis-

Note—Reprint from *American Machinist*, Oct. 21, 1909.


Use of Chart to solve expression:
M.E.P. = 3.46 P_1 (R$^{\frac{29}{29}}$ 1)
Find on curve the value of
3.46 (R$^{\frac{29}{29}}$1) corresponding to value of
R the absolute ratio of compression.
Multiply this by P_1, the absolute initial
pressure, giving M.E.P. in air cylinder.
M.E.P. ÷ 2.29 = I.H.P. per 100 cu. ft.
Piston Displacement per minute.
Example:- Compression from atmosphere to 100 lb. gage. R = 114.7 / 14.7 = 7.81. Value of factor from curve corresponding to R = 7.81 is 2.82 (at B)
2.82 x 14.7 = 41.4 lb. M.E.P. in cylinder. 41.4 ÷ 2.29 = 18.1 I.H.P. per 100 cu. ft. Piston Displacement per minute.
A
B
C
D
Values of Factor 3.46 (R$^{\frac{29}{29}}$ 1)
Values of Factor 3.46 (R$^{\frac{29}{29}}$ 1)
Values of Factor 3.46 (R$^{\frac{29}{29}}$ 1)
Values of Factor 3.46 (R$^{\frac{29}{29}}$ 1)
American Machinist, N.Y.

WARD RAYMOND'S CHART FOR DERIVING MEAN EFFECTIVE PRESSURES FOR ADIABATIC COMPRESSION OF AIR FROM ANY INTAKE PRESSURE

ton displacement of the low-pressure cylinder per min. will give the total horsepower of the compressor.

Utility of Diagram

A little practice with the use of this diagram will show its value for all kinds of special horsepower and mean effective pressure problems. It can be used for compression from initial pressures other than atmospheric, by the same process, simply finding the ratio of compression by dividing the absolute discharge pressure by the absolute initial pressure, whatever that may be. It must always be remembered that the mean effective pressure is obtained for any one cylinder by multiplying the factor obtained from the curve by the absolute initial pressure of that particular cylinder. The indicated horsepower per 100 cu.ft. obtained from this is always for the actual piston displacement of the cylinder in question, no matter what the pressure of air may be.

The curves may also be used for working backward, that is to find various pressures, compression between which will give a certain desired horsepower. In fact the flexibility of the diagram grows with continued use. The results obtained are closer than a slide rule will read and more than this would be hairsplitting.

Montezuma Mines of Costa Rica

The report of the manager of the Montezuma Mines of Costa Rica, Oct. 18, 1909, states that since July, 1909, 2295 cars of ore assaying an average of $11.22 gold per ton have been milled. The mill contains 40 stamps of 1000 lb. each, maximum capacity 150 tons daily. The stamps are followed by tube mills, classifiers and a 120-ton cyanide plant with agitators. The working costs at full capacity are stated to be $3.22 per ton. Water power amounting to 450 h.p. is available even during the most arid months.

The mine is variously estimated to have produced 86,000 to 150,000 tons of ore under different administrations before the present company secured it. The total amount expended by this company on development, improvements and construction from Dec. 1, 1908 to Oct. 1, 1909 was about $155,965. No figures regarding mill extraction or returns are given.

A report has been made to the State Department at Washington by George W. Ellis, the American chargé d'affaires at Monrovia, Liberia, Africa, to the effect that there are possibilities of important developments of gold and diamond mining in Liberia. One company is operating on an alluvial gold deposit with good results, and prospectors have found diamonds which have been pronounced by experts in England as of good quality and marketable size.

Gold in the Philippines*

By Henry G. Ferguson†

The gold production of the Philippines for the year 1908 shows a satisfying increase over that of 1907. In two out of the three principal districts there are mining companies which have successfully passed through the development stage and are now preparing to pay dividends. Everywhere development work is being carried on and, owing to the courage of the first pioneers, capital has begun to flow a little more freely. Those conditions which have kept investors from putting money into any Philippine industry apply with particular force to mining, for in most cases, the investor in an undeveloped mining property must wait for several years before he can expect any returns, and he must therefore be doubly certain of the safety of his investment. Under more favorable conditions the present prosperous state of the gold-mining industry might have been reached before this.

Masbate District

Of the three principal gold-mining districts of the islands, Masbate alone shows a falling off in production. This is due, not to any inherent defect in the district itself, but to a variety of causes.

Of the three stamp mills in the district, one five-stamp mill was found to have been poorly designed and therefore unsuited to the work required. It was dismantled two years ago. Neither of the two 10-stamp mills has been in operation during the year, one being idle on account of litigation and the other awaiting the reorganization of the company.

The district has suffered heavily from typhoons during the past year, the centers of no less than three passing near the mining district. The Lanang Dredging Company was a particularly heavy sufferer, as, besides having its houses and offices blown down, the dredge was wrecked and the pontoon badly damaged, though fortunately the machinery was uninjured. The accident was particularly unfortunate as it came just as operations, after two years of preliminary work under disadvantages which would have permanently discouraged many others, had finally reached a stage where substantial returns were to be expected. It is gratifying to report that this dredge is to be rebuilt.

In lode mining, continued development work is showing up large and easily worked orebodies. The ore is not as a rule of high grade, but natural conditions of the district are so favorable that mining costs should be cheaper here than elsewhere in the islands.

The chief development work of the year has been done by the Keystone Mining Company on Aroroy mountain, where the two shafts have been connected at 20 m. below surface by a drift at present 85 m. in length and a tunnel has been driven from the southwest side of the mountain a distance of 70 m. The Colorado and Eastern mining companies have both done considerable development work during the past year with very satisfactory results, the former in developing its vein system by continuing its tunnels and the latter by cutting a vein which is said to show 15 m. of workable ore. Both these companies expect to go ahead on a much larger scale during the coming year. Besides these, various individual miners have been doing steady development work, though they are greatly hindered by lack of funds.

As regards the district as a whole there has been a general realization that more extensive development work is needed before production is attempted. Therefore reorganization on a more businesslike basis is succeeding the period of depression which was the natural result of absurd overconfidence.

The district has further been benefited by the construction of a road from the village of Aroroy to the Guinobatan river. A light-house has been erected on Punta Colorada opposite Aroroy, allowing vessels to enter the harbor at night, and the harbor has been buoyed. The steamer service from Manila is better than ever before. During the year 1909 it is planned to extend the road up the Guinobatan river, through the heart of the mining district, to connect Aroroy with Masbate by telegraph, and to establish a money-order post-office at Aroroy; all of these small public improvements being things which the district needs and deserves.

Paracale District

Dredging is the chief industry in this district, and the dredge work there has already been described.[1] With regard to lode mining less has been done under the American régime than might have been expected. This delay, however, is due in great measure to the early confusion and uncertainty in regard to titles. At the present time the two principal mines of the district, the San Mauricio and the Tumbaga, both of which were formerly the property of the Philippine Mineral Syndicate, have been taken over by American capital. At the San Mauricio mine the old workings have been retimbered to permit of a detailed examination of the property, work has begun on sinking a shaft, and a 20-stamp mill has been brought out. On the Tumbaga property the old workings have been unwatered and preparations

*From "Mineral Resources of the Philippines," Bureau of Science, Manila.

†Division of Geology and Mines, Manila.

[1]Eng. and Min. Journ., Nov. 13, 1909, page 974.

made for continuing the sinking of the shafts. A Huntington mill, formerly the property of the old company, will be used for treating the ore.

There are many other groups of claims, such as the Mescla group near Mambulao, the Navotas group between Mambulao and Paracale, the San Antonio veins near Paracale, and the claims of the Aurora Exploration Company near Malagit, all of which have been worked to a greater or less extent in earlier times, which it is now proposed to reopen.

During the present year there are several improvements planned for the district aside from the mining work. The most important of these will be the removal of a reef which obstructs the entrance to the Malagit river, thereby affording excellent harbor facilities. At present there is no shelter nearer than Mercedes on the one hand and Mambulao on the other, and during bad weather the regular steamers can go no further than Mercedes, some 30 km. down the coast.

Other improvements planned for the district are the building of a telephone line and the construction of a wagon road from Indang. The Paracale Mining Association hopes to secure from the insular government some arrangement which will permit of having a resident mining recorder. At present there is unnecessarily great delay and confusion caused by the necessity of sending all papers to Nueva Caceres, the capital of the province.

Benguet Province

The Baguio mining district still holds its preëminence as the principal mining region of the islands, and during the past year work has gone steadily forward. The Consolidated Mining Company possesses a 6-stamp Hendy mill, three stamps of which were added during the past year, and a fairly complete and modern cyanide plant. The mine is worked from four tunnels having a total length of over 900 m. with about 100 m. of crosscuts. Some stopes have been opened up, but the company has wisely confined its attention almost entirely to development work, which has furnished sufficient ore for the mill. During the past year two agitators have been added for treating slimes and have greatly facilitated the treatment as well as increased the extraction. The company has installed a Wilfley table to treat the sands from the classifiers, thereby still further increasing the capacity of the plant.

The Bua Mining Company has over 600 m. of drifts, about 150 m. of crosscuts, and a 30-m. raise. Approximately 1500 cu.m. of ore have been removed by stopes. The ore is treated in a Hendy 6-stamp mill and a cyanide plant, similar to that of the Consolidated Mining Company.

The Camote mine is opened up by tunnels at four levels, having a total length of over 250 m. The ore is crushed in a small stamp mill made by Taylor in Manila. There are three 340-kg. stamps run by a 5-m. overshot wheel with a hemp-rope drive. The capacity is about 10 tons per day.

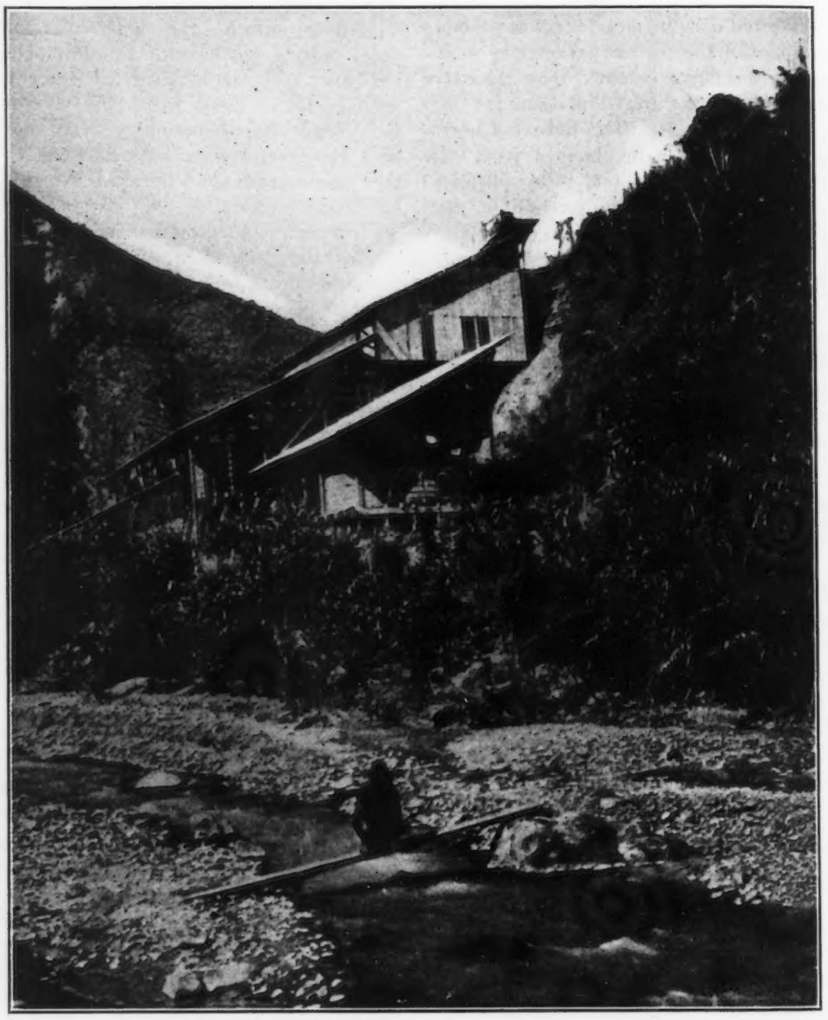
On Gold creek, Mr. Kelley's group of claims has been developed by about 570 m. of tunnels, crosscuts and drifts, showing up large bodies of ore. Of particular interest is the discovery of rich telluride ore on the Naptang claim.

The Headwaters Mining Company was organized during the past year and has so far run three prospect tunnels in ore of 18, 33, and 12 m. length.

Other Districts

The Aroroy, Paracale, and Baguio districts are the only places in the Philippines where gold mining has been carried on to any extent. In other parts of the islands vigorous prospecting has been going on, and the coming year may show much in the way of developing new districts.

In Suyoc, on the boundary between the subprovinces of Benguet and Lepanto, prospecting and some development work are going on, but the comparative inaccessibility of the district delays development. The district of Binanlonan, Pangasinan, is being prospected, though the deposits have not as yet been developed to any extent. In Nueva Ecija a certain amount of sluicing has been carried on and small amounts of gold are obtained from native washings, but unfortunately we have no returns as to the amount of gold extracted. In the Catanduanes islands and in northern Mindoro prospecting of placer grounds is progressing. In the Surigao peninsula prospecting is being carried on by Americans, and a considerable amount of gold is washed from the streams by natives.



BUA MILL, ANTIMOK, BENGUET PROVINCE, PHILIPPINE ISLANDS

The Algerian mineral export in 1908 was as follows: Iron ore, 834,921 metric tons; copper, 4449; lead, 24,730; zinc, 78,301; antimony, 500 metric tons.

Comparison of the Thermal Properties of Cupels

Differences in Action of Magnesite and Bone-Ash Cupels; Temperatures of Cupellation; with Patent Brands Beads Less Likely to Spit

BY C. O. BANNISTER AND W. N. STANLEY

Although there are now a large number of cupels on the market made of materials other than bone-ash, yet little has been published on the differences met with in the behavior of these as compared with bone-ash cupels. The differences observed are many, among them being the following:

(1) If similar cupellations be carried out in patent[1] and in bone-ash cupels side by side, a marked difference will be seen in the mode of procedure of the process. The lead on the bone-ash cupel during the cupellation appears very bright and very hot, whereas the lead on the patent cupel appears to be at a much lower temperature, being comparatively dull during a considerable part of the operation.

(2) Patent cupels require a higher cupellation temperature than bone-ash cupels, and under similar conditions take a longer time to cool down.

(3) If the cupels containing silver beads be withdrawn in such a manner as to encourage "spitting," then the nature of the "spit" is quite different in the two types of cupels, there being a far greater tendency to spit on bone-ash than on patent cupels; the spit on the latter generally takes the form of a frosty appearance only, while on the bone-ash the well-known "vegetation" is obtained. Should, however, spitting be enforced on a patent cupel by bringing it out of the muffle very hot and blowing cold air on the bead, then the spitting takes the form of a burst, often a considerable amount of the silver being blown off in the case of large beads.

(4) Cupellation losses are always lower on good patent than on bone-ash cupels.

(5) If the method of inquarting small bullion beads from gold ores, etc., with fine silver be attempted on patent cupels, it will be found to be practically impossible with a mouth blowpipe, although the same operation is compartively easy on a bone-ash cupel.

It will be readily seen that these differences noted between the behavior during cupellation, etc., all depend on differences in the thermal properties of the materials of which the cupels are made, and the following experimental work has been carried out with a view of determining the diffusivity of heat, the specific heat, and the rate of cooling, etc., of the different materials.

Diffusion of Heat

Two different sets of comparisons of diffusivity were made, one up to a temperature of 100 deg. C. by the use of a steam jacket, and the other at a much higher temperature during the actual process of cupellation. Although the coefficients of conductivity have not been determined, comparative figures are given which show that there is a decided difference in the diffusivities and that this difference partly accounts for the difference in appearance of the lead during cupellation on patent and on bone-ash cupels.

For the experiments up to 100 deg. C., a steam jacket was made with top slightly hollowed upon which to set the cupels. Three makes of cupels were prepared of exactly the same shape and size. In each was placed the same amount of mercury whose temperature was recorded. At the end of 14 min., the temperature of the mercury in the patent cupels was practically constant at 91 and 89 deg. respectively, while that in the bone-ash cupel was only 60 deg. This shows that the diffusivity of patent cupels is much greater than that of the bone-ash cupels.

Experiments at Cupellation Temperatures

In these experiments, arrangements were made for determining the variations in temperature at the top and at the bottom of the cupels during the first part of the cupellation process. The temperature was gradually raised until 950 deg. was indicated and the gas was carefully regulated to keep this temperature constant; when the whole had remained constant for some considerable time, the muffle was opened for one minute, then 30 grams of lead, rolled up and bent into the shape of a horseshoe in order to fit round the thermo-couple protection tube, was inserted and the muffle closed. Meantime temperature readings were being taken every ¼ minute. An accompanying table gives the results obtained for the different cupels.

The cupels had been previously prepared to the same size, particular care having been taken to have them the same thickness in the center. The experiments could only be carried on with confidence for six minutes owing to the corrosive action of the litharge on the thermo-couple protection tube.

TEMPERATURES DURING CUPELLATION.

Time, Minutes.	Patent Cupel, Brand A.		Patent Cupel, Brand B.		Bone-ash Cupel.	
	Top, Deg. C.	Bottom, Deg. C.	Top, Deg. C.	Bottom, Deg. C.	Top, Deg. C.	Bottom, Deg. C.
	950	950	950	950	950	950
¼	930	947	935	947	935	950
½	912	944	923	945	923	950
¾	905	942	914	942	914	950
1	900	940	911	940	907	950
1¼	815	938	770	936	857	947
1½	803	935	818	929	805	945
1¾	848	927	850	919	855	942
2	866	912	868	905	887	940
2¼	874	903	881	895	908	938
2½	888	899	891	895	925	935
2¾	895	899	899	895	937	932
3	900	899	906	895	945	930
3¼	902	899	911	895	953	928
3½	907	899	916	895	961	925
3¾	909	902	920	897	967	923
4	910	905	924	900	973	920
4¼	912	908	928	905	977	925
4½	914	910	930	912	981	930
4¾	915	912	932	917	983	931
5	916	913	935	920	985	931
5¼	917	914	937	923	987	931
5½	918	915	938	926	989	932
5¾	919	917	939	928	990	932
6	920	918	940	930	990	932

Various attempts have been made to measure the temperature of cupellation muffles and also the actual temperature of cupellation, the earliest results being those obtained by James Prinsep,[2] who made trials in the same muffle with alloys containing varying quantities of gold and silver, and from his results the following approximate temperatures are deduced: Front of muffle, 961 deg.; middle, 1020; back, 1042. The next set of determinations on record was obtained by Dr.

NOTE—Abstract of paper read before the eighteenth session of the Institution of Mining and Metallurgy, London.

[1]The word "patent" is used to indicate cupels made with a magnesite base.

[2]*Phil. Trans.*, 1828, 79-96.

Rose[3] who used the Le Chatelier pyrometer and obtained results varying between 1022 and 1095 deg., according to the position in the muffle, etc.

A further set of figures is given in the text-book by Lodge[4]. These were obtained by means of a Le Chatelier pyrometer, the junction being kept about ¼ in. above the lead button. The results show that at 700 deg. crystals of litharge form all about the button, at 775 deg. crystals of litharge form on the cooler side of the cupel only, while at 850 deg. no more crystals of litharge are formed.

Dr. Rose states[5] that the lowest temperature at which lead uncovers is about 675 deg., that a good temperature for the air in the muffle is 700 deg., and that litharge freezes at about 640 deg. Fulton[6] states that for silver cupellation the temperature should not be above 700, and for silver-gold alloys 750 deg.; he gives as the freezing point of litharge, 906 deg.

Summary of Earlier Results

The latest figures published on cupellation temperatures were obtained by C. H. Fulton,[7] assisted by O. A. Anderson, J. E. Goodner, and J. D. Ossa. These authors summarize their work as follows: (1) In the case of pure lead-silver buttons, a muffle temperature of at least 800 deg., and preferably one of 850, is necessary to "uncover" or start cupellation; (2) that this temperature may be lowered to 770 deg. during the oxidation of the greater part of the lead; (3) that toward the end of the cupellation or "finishing" in case of silver, it must again be raised to about 850 deg., in order to get a pure silver button; (4) that the actual temperature of the cupelling lead is always higher than the muffle temperature; (5) that the actual finishing temperature of the cupellation cannot safely be carried below 910 deg.; (6) that "feathers" or crystals of sublimed litharge on the cupel are an indication of the proper cupellation temperature, provided the air draft is not excessive. It will be seen from these figures that opinions vary considerably as to correct muffle temperatures for cupellation.

As this problem is outside the scope of the present paper, a fairly high temperature was decided on, namely 950 deg., in order to insure the rapid melting, uncovering, and cupellation of the lead introduced. It may be pointed out that the lower the initial temperature used in carrying out these experiments the more marked will be the results obtained. The temperature of commencement of cupellation is a very important matter and is at present receiving attention.

Behavior of Cupels

Curves were plotted from our experiments and on analysis gave the following results: On following the curve for patent cupels, brand A, it is seen that in the first minute, during which the muffle is merely opened, the temperature at the top of the cupel falls to 900 deg., and on the introduction of the lead button the temperature falls to 765 deg. during the next 22 sec.; then a rise of temperature immediately commences owing to the oxidation of the lead. For the first minute the rise is rapid, after which it is slow for another minute, then the temperature rises very slowly to the end of the experiment, and at the end of 6 min. the temperature is actually 30 deg. lower than the commencing temperature.

On following the other curve it will be seen that the temperature falls 15 deg. at the bottom of the cupel in the first 1½ min., due to the opening of the muffle; a fairly rapid fall of 20 deg. is next noticed, due to the introduction of the lead button, and this takes place ½ min. after a similar but more marked drop at the top of the cupel; the temperature continues to fall slowly for a further ½ min. and then becomes steady for 1 min., after which a slow rise of only 18 deg. in 2½ min. takes place.

This increase in temperature is the result of the rise in temperature at the top of the cupel which occurred at the commencement of cupellation 2¼ min. before. Finally, it must be noted that the top and the bottom of the cupel are at practically the same temperature at the end of 6 minutes.

The curves obtained with patent cupel, brand B, are very similar to those of brand A, just described, but in this case the top does get hotter than the bottom, a difference of 10 deg. being noted at the end of 6 min., by which time also the temperature is within 10 deg. of the initial temperature.

The curves obtained with the bone-ash cupel, are similar as far as the commencement of the cupellation goes, but after the operation has started the temperature at the top of the cupel rises more rapidly, while the rise in temperature at the bottom is not shown until after the fourth minute, and then only a rise of 12 deg. is obtained in the remaining 2 min. At the end of 6 min., the temperature of the top of the cupel is 40 deg. higher than the commencing temperature and 58 deg. higher than the temperature of the bottom of the cupel. The chief points noted during these experiments are summarized in an accompanying table.

Comparison of Curves

The following reasons are suggested for the variations in the shape of the curves obtained. The first fall in temperature of the top is due to the cold air admitted into the muffle on opening the door. The amount of this fall will depend on the conditions of the experiment; in the patent cupels a fall is also noticed on the bottom, but not in the bone-ash cupel; this is due to the lower diffusivity of heat in the bone-ash, and therefore any change in temperature of the outside of the cupel takes longer to affect the middle. The marked fall of temperature next noted in top of each cupel is due to the melting of the lead introduced.

The bottom limit of this fall was very difficult to decide, but in every determination it came higher in the case of bone-ash, probably due to the fact that the surface of these cupels is never quite so smooth as in patent cupels. The effect of this cooling taking place at the top of the cupel is quickly shown at the bottom also of the patent cupels, a fairly rapid fall in temperature being noted; in the case of bone-ash, however, a slow but long continued fall of temperature is observed, this again being due to its low diffusivity for heat.

From the point at which cupellation commences the curves are most interesting; the rapid rise in temperature is practically the same in all three cases, and the top and the bottom reach the same temperature after the bottom has reached its minimum point in the case of the patent cupels, but while the temperature of the bottom is still falling in the case of the bone-ash cupel. After the curves have crossed and the top becomes hotter than the bottom, an increase in temperature of the top and bottom takes place.

In the case of the patent cupel, brand A, the temperature is comparatively low at the end of 6 min. and the top and bottom very nearly approach the same tempera-

SUMMARY OF TEMPERATURE CHANGES.

	Effect of Opening Muffle, 1 Min.	Introduction and Melting of Pb.	Commencement of Cupellation.	Continuation of Cupellation, 3 Min.	Comparison With Initial Temp'ature.	Difference Between Top and Bottom at End of 6 Min.
Patent cupel A top	Fall of 50°	Fall of 135°	Rise of 135°	Rise of 20°	Fall of 30°	2°
Patent cupel A bottom	Fall of 10°	Fall of 3°	Fall of 37°	Rise of 18°	Fall of 32°	
Patent cupel B top	Fall of 40°	Fall of 140°	Rise of 136°	Rise of 34°	Fall of 10°	10°
Patent cupel B bottom	Fall of 10°	Fall of 5°	Fall of 40°	Rise of 35°	Fall of 20°	
Bone-ash cupel top	Fall of 43°	Fall of 102°	Rise of 140°	Rise of 45°	Rise of 40°	58°
Bone-ash cupel bottom	Fall of 0	Fall of 5°	Fall of 15°	Rise of 2°	Fall of 18°	

[3] *Journ. Chem. Soc.*, LXIII, 1893, p. 707.

[4] Notes on assaying.

[5] "Metallurgy of Gold," fifth edition, 1906, p. 451.

[6] "Manual of Fire Assaying," p. 71.

[7] *West. Chem. and Met.*, Vol. IV. pp. 31-54. Also Eng. and Min. Journ., Aug. 15, 1908, p. 326.

ture, these facts being due to the greater diffusivity and also greater specific heat of these cupels. In the case of the patent cupel, brand B, the temperature at the top and at the bottom is somewhat higher than in brand A, at the end of 6 min., being 20 and 12 deg. hotter respectively, and this is accounted for by the fact that this brand has a slightly lower diffusivity and specific heat.

In the case of the bone-ash cupel, the temperature at the top rises to a comparatively high figure while the temperature at the bottom rises very little, so that there is a considerable difference between the temperature at the top and at the bottom (58 deg.), this being due to the lower conductivity and specific heat and may in part be due to the difference in the nature of the surface of bone-ash cupels. The natural conclusion from these experiments, and one that can easily be proved by ocular demonstration, is that the temperature of the cupelling lead is lower in the patent than in bone-ash cupels, at any rate during the commencement of the operation, even when maximum temperature was reached in the case of the bone-ash, only after 2½ minutes.

In considering these figures it should be remembered that the specific heat of solid lead is 0.031 and of molten lead 0.035, the specific heat differences of the cupels thus being magnified about six times in the temperature of lead at the melting point. The relative mass of patent cupels is much greater than of bone-ash cupels and this tends to increase the effect of any difference in the specific heats.

Bearing this in mind, it will be evident that the differences noted in the specific heats will help to explain some of the differences in the cupellation temperature curves. For example, the bone-ash cupel, having a lower mass and lower specific heat, must have a considerably lower capacity for heat, and hence, being unable to absorb the heat of oxidation of the lead button, the latter reaches a much higher temperature than similar buttons on patent cupels, for these have a greater mass, a higher specific heat, and therefore a greater capacity for heat.

TEMPERATURES WHILE COOLING SILVER.

		Time Required for Silver to Solidfy, Sec.	Time Required for Silver to Spit, Sec.	Time Required for Outside of Cupel to Lose Visible Heat, Sec.	Time Required for Cupel to Lose all Visible Heat, Sec.
First set	Patent cupel, brand A	35	100	...	...
	Patent cupel, brand B	27	112	...	...
	Bone-ash cupel	10	63	...	...
Second set hotter	Patent cupel, brand A	75	105	...	...
	Patent cupel, brand B	45	140	...	...
	Bone-ash cupel	15	75	...	...
Third set	Patent cupel, brand A	...	135	114	149
	Patent cupel, brand B	...	140	129	155
	Bone-ash cupel	...	83	35	133

the cupels are both at the same muffle temperature. This does not hold good after the cupels are more or less saturated with litharge, and is not evident toward the end of the operation. The effect of saturating the cupel with litharge is at present under consideration, and the results of these experiments will be communicated later.

Specific Heat

The specific heats of these cupels were determined by means of Regnault's specific heat apparatus, corrections being added for radiation of heat during the experiment.

After experiments made for the purpose it was considered safe to assume that no chemical action likely to vitiate the specific heat results took place.

The following were the mean figures of many determinations for the different cupels between 100 and 15 deg. C.: Patent cupel, brand A, 0.215; patent cupel, brand B, 0.210; bone-ash cupel, 0.185. In carrying out these experiments confirmation was obtained of the greater diffusivity of the patent cupels, for on dropping them into the water, a maximum temperature was reached in 1½ min., while a

Rate of Cooling

For these experiments a fairly large button of silver was cupelled with lead on the different cupels of the same size, and the cupels were removed from the muffle while the silver was still molten, and the times noted for the various changes to take place during the cooling down. The accompanying table is made from a large number of observations, in order to illustrate the differences.

From these figures it will be evident that there is a considerable difference in the rate of cooling and in the time required for the solidification of the silver beads. These differences are due to the differences in the thermal properties of the cupels, and in them is also found the reason for the fact that the nature of the "spit" on silver beads is different. It is probable that during the longer time required on patent cupels for the silver to reach the temperature at which spitting can take place, the solid surface skin of the bead becomes fairly thick and withstands rupture at the moment when the oxygen is liberated. This appears to be confirmed by the fact already mentioned that when spitting is forced a burst takes place, often accompanied by the blowing off of pieces of solid crust of considerable size. In the case of silver beads on bone-ash cupels, these reach a "spitting" temperature in less time, more can take place, the solid surface skin has become thick enough to withstand rupture; a small opening is thus created in the skin and a portion of the still molten silver inside the beads is forced through, forming the well known vegetation spit.

Conclusions.

(1) There are great differences in the thermal properties of patent and bone-ash cupels.

(2) The diffusivity of heat and the specific heat of patent cupels are greater than those of bone-ash cupels.

(3) During cupellation at the same muffle temperature, the actual temperature of the cupelling button is much lower on patent than on bone-ash cupels.

(4) Silver beads take longer to solidify and to spit on patent than on bone-ash cupels after being withdrawn from the same muffle temperature.

(5) Silver beads are much less likely to spit on patent than on bone-ash cupels, and the nature of the spit is different in the two cases.

Lime Production in 1908

Lime production in the United States in 1908, in common with other industries, decreased in both quantity and value of output. Many plants that had closed in 1907 remained closed during 1908, and some plants ran only part of the time or with diminished force.

The lime made in 1908 amounted (*Press Bull.*, U. S. Geol. Surv.) to 2,766,873 short tons, valued at $11,091,186, a decrease of 325,651 short tons in quantity and of $1,565,519 in value from the production of 1907. The value of the lime produced in this country during the last twelve years is shown in the accompanying table:

VALUE OF LIME PRODUCED IN THE UNITED STATES.

1897	$6,390,487
1898	6,886,549
1899	6,983,067
1900	6,797,496
1901	8,204,054
1902	9,335,618
1903	9,255,882
1904	9,951,456
1905	10,941,680
1906	12,480,653
1907	12,656,705
1908	11,091,186

In 1908 Pennsylvania ranked first in both quantity and value of output, and Ohio, Wisconsin, Missouri, and Maine followed, in the order named.

The largest use of lime is that for building; the next largest is that for fertilizer. Considerable quantities are used by paper mills, chemical works, sugar factories and tanneries. The production of hydrated lime, a comparatively new industry, requires large operations, and many new hydrating plants were established in 1908.

Improvements in the Dry Air Blast

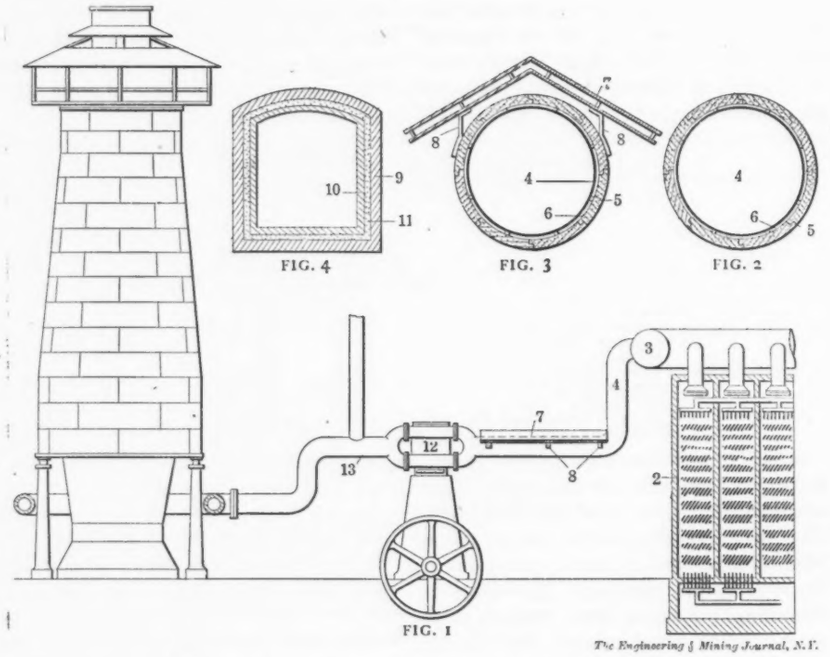
A new patent has been taken out by James Gayley, which may be regarded as a supplement to and completion of his dry-air blast. This patent—No. 935,628, dated Sept. 28, 1909—is the result of experiments and investigations made in the operation of the dry air blast. The original invention was made and operated entirely for the purpose of reducing the moisture in the air to a small and substantially uniform content. The results obtained by this are now well known and are a matter of record, to which frequent reference has been made.

In experimenting with the process, however, it became apparent that it is of importance, not only to reduce the moisture in the air to a small and uniform content, but also to supply air to the blast furnace or converter at a substantially uniform temperature, in order that the weight of air shall be uniform. The blowing engine will measure the air as it passes through, and will deliver practically a uniform volume; but the weight of the air so supplied will vary with its temperature. The air-drying plants thus far installed have generally been placed with reference entirely to convenience, especially with relation to other buildings about the furnace, and have often been at a considerable distance from the blowing engine, without recognizing any disadvantage in such an arrangement. In experimenting with the blast it has been found that the long pipes required to carry the air cause considerable variations in the temperature and consequent weight of the air as it reached the blowing engines. The pipes are subjected to the rays of the sun by day and to cooler air by night, the variation in temperature being frequently 10 to 20 deg. or more. A difference of 20 deg. F. in temperature represents a variation of about 4 per cent. in the weight of the air. In a large modern blast furnace this would make a variation of about 150 lb. per minute in the weight of air furnished.

The present patent, therefore, covers methods devised to make the temperature—and consequently the weight—of air supplied to a blast furnace or converter uniform, as well as the moisture content. In his specifications Mr. Gayley says: "The raw materials of the furnace are made as uniform as possible, but the air consumed per ton of iron is 50 per cent. greater by weight than the raw material; and it is therefore important to deliver air to the furnace which is uniform in weight, as well as in moisture content per unit of volume. The variation in the weight of the air will increase or retard the rapidity of combustion of the fuel in the blast furnace, and thus cause a change in the fusion or combustion zone of the furnace. Such a change in this zone often causes the furnace charge to stick or hang on the walls, and these hanging portions, when dislodged, cool off the furnace hearth and interfere with the uniformity of furnace operation and the grade of metal produced. These disturbances, I have found to exist independently of the percentage of moisture in the air, since air of varying temperatures can, and often does, contain the same quantity of moisture. Air of varying temperatures, however, cannot contain the same weight per unit of volume; and the purpose of my present invention is to secure better uniformity in the metallurgical process by supplying air of substantially uniform temperature and therefore substantially uniform weight, as well as of substantially uniform moisture content, to the blowing engine, and hence to the furnace or metallurgical apparatus. In carrying out this discovery when air-drying apparatus is applied to existing plants, where the air-drying apparatus is remote from the blowing engine, I jacket or otherwise protect the air conduit leading from the air-drying apparatus to the blowing engine, in order to preserve a substantially uniform temperature of the air therein, and thus supply air of substantially uniform weight, as well as substantially uniform moisture content, to the blowing engine."

In the patent drawings, which are reproduced herewith, Fig. 1 is a sectional elevation showing one form of apparatus for carrying out the invention; Fig. 2 is a section of a jacketed pipe; Fig. 3 a section of a jacket with shield; Fig. 4 a section of an underground conduit.

In the drawings, 2 represents a portion of a refrigerating and air-drying apparatus, which may be constructed in accordance with previous patents, or in any other desirable way, the function of this apparatus being to reduce the moisture content of the air to a small and substantially uniform percentage. From this apparatus the dried air enters a pipe 3, whence it passes into the air conduit 4, leading to the blowing engine. The vertical portion of this pipe or conduit 4 is jacketed, for example, as shown in Fig. 2 In this figure 5 represents insulating material forming a jacket around the pipe and spaced apart from the pipe to form an annular air space 6 between the pipe and the jacket.



APPARATUS FOR PRESERVING UNIFORMITY OF TEMPERATURE IN BLAST

Any horizontally extending portion of the pipe above ground is also preferably protected by a roof or shield 7, shown in Fig. 3, this roof or shield being double with an air space between. It may be supported on the conduit itself by brackets 8. If the conduit is under ground, it is preferably constructed as shown in Fig. 4, in which 9 is an outer wall, 10 the inner wall or conduit proper, and 11 a layer of insulating material between the two walls.

The blowing engine cylinders are represented at 12, 13 being the pipe leading from the blowing engines to the blast furnace or point of use. The patent, however, is not limited to the special arrangement shown, as any suitable means of delivering the air at a uniform temperature may be used. The terms "blast fur-

nace or converter" are intended to cover any metallurgical apparatus employing an air blast under pressure. The claims of the patent are five in number, as follows:

1. The method of operating blast furnaces or converters using an air blast, consisting in reducing the moisture content of the air to a small and substantially uniform percentage, supplying the dried air at a substantially uniform temperature and weight to blowing engines, and then forcing this air to the furnace or point of use; substantially as described.

2. The method of obtaining uniformity in the operation of blast furnaces and converters, consisting in supplying thereto air of a small and substantially uniform moisture content, and of a substantially uniform temperature and weight.

3. The method of supplying air to blast furnaces and converters, consisting in reducing the air to a low and substantially uniform temperature, reducing its moisture content to a small and substantially uniform percentage, maintaining the air thus treated at a substantially uniform temperature as it passes to the blowing engines, and then forcing said air to the blast furnace or converter.

4. In air supply apparatus for blast furnaces or converters, a refrigerating chamber, arranged to reduce the air to a low and substantially uniform temperature and to a low and substantially uniform moisture content, a blowing engine between the refrigerating chamber and the blast furnace or converter, and a conduit connecting the refrigerating chamber and the blowing engine and arranged to maintain a substantially uniform temperature of the air at the blowing engine.

5. The combination with a refrigerating chamber and a blowing engine, of a conduit connecting the same, and a conduit extending from the blowing engine to a blast furnace or converter, and means for insulating or protecting the conduit between the refrigerating chamber and the blowing engine, whereby air of a substantially uniform temperature and weight, as well as of a substantially uniform low moisture content, is supplied to the blowing engine.

The extensive onyx deposits of the Cervantes estate near Etla, Oaxaca, Mexico, have been taken under option by Consular Agent Lawton, of Oaxaca and associates. These deposits have not been systematically developed by the owners, but have been worked to some extent, and are part of extensive onyx deposits, some of which have been worked for about twenty years. The onyx is of close grain, of beautiful coloring, and fair weathering qualities, and the ease of working it, together with the extent of the deposit, makes it potentially valuable.

Ore Deposits in the Vicinity of Parker, Arizona

SPECIAL CORRESPONDENCE

For many years the region along the Colorado river, in the vicinity of the Parker Indian reservation, and on both the California and Arizona sides of the river, has been known to be a field of promise for the copper miner. Development, however, was slow until the building of the California & Arizona railroad. With the town of Parker as a center, a circle drawn on a radius of 20 miles would include within its area four important ranges, or parts of ranges, in which are copper, copper-gold and gold-ore deposits. There is one district where surface conditions indicate that lead minerals may be the basic ore carrying the gold, shallow workings having produced considerable material of this kind. These deposits occur in the Plomos mountains, 15 to 20 miles southeast of Parker. Some minerals of tellurium have also been found there.

Southwest of Parker, 18 miles, is the Riverside range, in which two companies are developing groups of claims, while the individual prospector is exceedingly busy. The ore-bearing formations are schists and limestones; the ores are copper-gold and gold, the gold tenor of those deposits now being developed being somewhat higher than in the copper ores of the other districts. West and north of Parker are the Whipple, Turtle and Copper Basin districts, the latter having been the scene of more or less activity for many years. A large area here is intensely mineralized and a number of operators are now opening ground; one company, it is stated, is mining ore of shipping grade. The Calumet & Arizona company, of Bisbee, has recently acquired the Horn group in the Turtle mountains.

ORE OCCURRENCE

The districts north and northeast of Parker have been more extensively developed and are being more vigorously attacked at present. A type of ore deposition in this district, serving to illustrate that in other mines in the same formation, is found on the property of the Arizona Empire Copper Mines Company. This property is nine miles northeast of Parker and exhibits all of the features characteristic of this area, both as to ores and geology. A geologic section from the river easterly through the Eagle, Carnation and Cyclone groups, begins at the river, with a red-brown granitoid basic rock, generally coarsely crystalline, intruded by gray porphyry dikes, along the course of which are copper-bearing veins, as yet undeveloped. This is succeeded by a gneiss in which are no mineral veins of commercial importance. Lying against the eastern margin of this gneiss is an eruptive rock (syenite), in and over which are the uptilted limestones, shales, schists and quartzites of the ore-bearing zone. These have been intruded on the bedding planes by the same eruptive. Overlying all are flows of dolerite lava.

The sediments have been folded, and the ore deposits occur in the contacts and in the fault fissures due to the folding movement. Along the lines of contact with the limestone, the shales and limestones have been silicified to a marked extent, and the exposures are much like quartz veins. Mineralization along these contacts extends into both the shales and limes, forming chamber deposits in the lime and permeating the shales as a general impregnation of the lamination and fracture planes; the whole forming an ore-bearing zone with a core, or central vein, of quartz or quartzose material heavily mineralized with copper minerals. The gangue of this central vein is usually silicious, and the minerals, to the depth attained, entirely products of oxidation. Sulphides have not yet appeared. An important feature of these deposits, commercially, is the comparatively high gold tenor. This metal is present in all the ores thus far developed in this region.

HEMATITE ACCOMPANIES ORES

Hematite in the form of specular iron is a characteristic accompaniment of all of these deposits, large masses in chambers and veinlets occurring throughout both the limestone and shales, but especially in the contact zones. These bodies invariably contain gold in varying amounts, such determinations as have been made indicating an average content in the neighborhood of $5. They will probably give place to copper or copper-iron minerals, in depth. At what depth the sulphide zone will be encountered is undertermined and will likely be first ascertained by the drilling operations about to be inaugurated by the Arizona Empire company. That the intricate system of veinlets in the mass of contact shale, now filled with oxidized copper ore, will have the mineral replaced by sulphide ores in depth, is the opinion of several prominent engineers who have inspected these holdings.

Two miles southeast of the Cyclone group, the company has acquired and will develop the Wardwell and Osborne group of six claims, where the showings are as strong and in general the same as those of the groups described. Pipe lines to the river will be laid, and the entire property vigorously developed. The Lewisohns are developing the Planet mine to the northeast of this district in the same formations. The Clara Consolidated is finishing its smelting plant and railroad at Swansea. The Arizona Empire company is preparing to test its properties with a core drill to learn the depth at which sulphides occur. The working shaft will not be sunk until this drilling is accomplished.

European Methods of Entry Timbering in Coal Mines

By Henry M. Payne*

Notwithstanding the fact that in many of the coal-mining districts of Europe, timber must be imported from the Scandinavian forests, it is found in greater quantities and is used with greater prodigality than in America. In Belgium and northern France, especially, the seams are multi-folded, and mining is carried on at great depths, frequently exceeding 3000 ft., and a squeeze when once allowed to start, generally necessitates abandonment of that section of the mine.

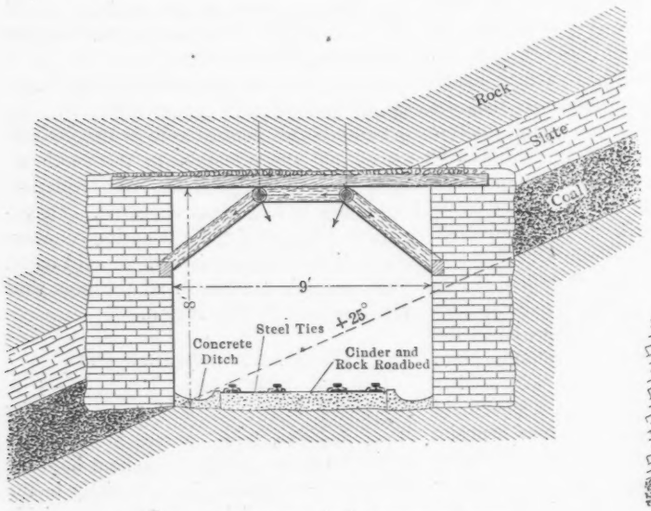


FIG. 1. TIMBERING IN A BELGIAN MAIN ENTRY

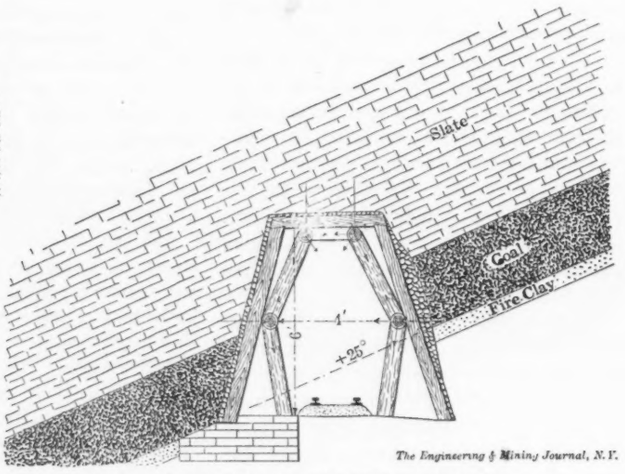


FIG. 2. METHODS OF TIMBERING A BELGIAN CROSS ENTRY

Almost universally, under these conditions, a double set of timbering is carried on, or in the case of main haulageways, brick walls are built with a special timber plate in the sides, and the cap timbers are reinforced by the two beams extending parallel to and over the center of each track, and stiffened at intervals by timbering, as shown in Fig. 1.

In cases where the top is especially bad, or where a fireclay vein immediately below the coal, gives much trouble from "pucking," an excavation is made on the lower side of the entry, and a brick or broken-rock foundation is laid (see Fig. 2). Ordinary timber sets are then placed, about 18 in. apart, the caps are notched down over the post, and the back is closely lagged and packed. Inside of this a second timber set is placed, the upper part similar to that of Fig. 1, the lower part taking the place of the masonry. The cost under these conditions is from 25 to 30c. per ton.

Mine Timbering in France

In the Pas-de-Calais district of France, in many places, steel hoops or rings are used in place of timbering. These are about the weight and section of a 12-lb. mine rail, and are placed 1 m. (3.25 ft.) apart, filled solid between with flat lagging.

The lower ends rest on longitudinal sills, which in places of extreme pressure, or at great depths, are tied, underneath the track, to prevent spreading or squeezing. These rings, the ties and the lagging are shown in Fig. 3.

In this same district, if it is not necessary to cover the whole area with lagging, a form of hook is used to hold these rings in position. These hooks are made of ¼-in. to ⅜-in. round iron, and are placed at intervals of 9 in. to 1 ft. apart around the crown of the arch. These are shown also in Fig. 3.

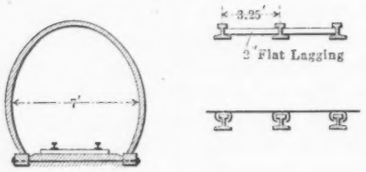


FIG. 3. French Entry Lining.

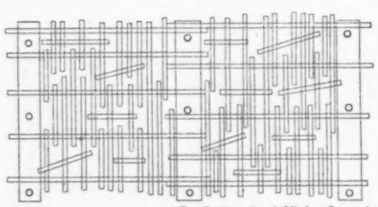


FIG. 4. GERMAN ROOM TIMBERING

The horseshoe-shaped rings are in two parts, clamped at the top, and fastened with steel wedges. When bent by rock pressure, they are easily removed, reshaped and put in place again. The original cost per ring is about $5, and they are used over and over again, the construction in two sections and the clamp and wedge joint permitting variations in width and hight. The flat lagging costs about 4c. per ring, equal to 1 m. distance along the entry.

In many mines in Europe, the lagging is made by fine brush and twigs, carefully trimmed in the forests, and bundled and carried into the mines, this material being cheaper than ordinary lagging.

Timbering Rooms in Germany

A favorite method of room timbering in Germany, in mines having draw slate or soft top, is shown in Fig. 4. Ordinary room props are placed about 3 ft. apart in rows from 5 to 8 ft. apart, and instead of separate cap boards to each post, one long cap board or half-round timber is wedged across the top of each row. At right angles to these, and extending from one row to the next, smaller pieces, usually poles about 2 in. in diameter, are placed, and again, crosswise of these, and parallel to each row of props, are driven short, flat pieces, so as to cover the entire area of the roof with a network of timbering. This method costs from 4 to 6c. per ton on advance work, and in mines where the old works are filled with sand by the flushing method, the cost does not exceed 4c. per ton.

The extremely low death rate per thousand men employed in these countries is attributable as much to the precautions taken in timbering as to those in the use of explosives.

During the past year, the average daily wages paid coal miners in Germany was 97c. for work in the pit, and 71.4c. for work on the surface.

It is believed that the present law in England restricting miners' working time to eight hours a day will stimulate the use of coal-cutting machinery in order to maintain the usual output.

*Consulting mining engineer, Morgantown, W. Va.

A Cherry Miner's Last Message

By Floyd W. Parsons

The following diary was found on the person of a young miner, whose body was among the last to be brought out of the St. Paul mine at Cherry, previous to the final sealing. Any comment would only detract from the completeness of the message:

"November 13, 1909—Alive at 10:30 o'clock yet. Alfred, my brother, is still with me. A good many dead mules and men. I tried to save some, but came almost losing myself. If I am dead give my diamond ring to Mamie Robinson. The ring is at the post office, where it was sent. Henry Caumicent can have the ring I have in my good clothes. The only thing I regret is that my brother is here, and cannot help my mother out after I am dead and gone.

"I tried my best to get out, but could not. I saw Jim Jamieson and Steve Timko lying dead along the road and could not stand it any longer. So what is a fellow going to do when he has done the best he can? It is five minutes past 11 o'clock and the air is fine, but at times it is so bad it almost puts a fellow's light out. It is something fierce to see men and mules lying all around like that.

"To keep me from thinking I thought I would write these few lines. There is rock falling all over. We have our buckets full of water, sump water, and we drink it and bathe our heads with it. 3 o'clock, poor air and blackdamp. 4:15 o'clock, change of place. No blackdamp, but poor air.

"We lost a couple of our group. Two men tried to get out and could not get back. 7:50 o'clock, tired, hungry and sleepy, but I could stand quite a bit of this if I could get out of this hole. So what is the use of knocking when a man is down? 7:50 o'clock in the morning. This is Sunday. 8:18 o'clock on Sunday morning. There is no air. We fanned ourselves with the lids of our buckets. 9:25, and blackdamp coming both ways. 10:25, we were past the party and could not get any further. We gave up all hope. We have done all we could. The fan had better start above soon. 10:25 a.m., Sunday. Still alive, that is, you will find me with the bunch. It is 11 a.m. There are six of us: Alfred Howard, Miller, Leyshon, Sam, D. Howard, Steele, and Gus Francisco. We are still alive. The only hope is the fan.

"I think I won't have the strength to write pretty soon. 12:15 p.m., Sunday. We are having a swell time making fans. If they can't give us air, we will make some ourselves. That is the best we can do. We have three of them going. Joe Rapsel was the man who invented the fan. 3:25 p.m. The blackdamp is coming in on us. Only for the fans we would be dead. Dying for the want of air. 6:20 p.m. Now we are trying to make the bottom with the fans. We have six of them moving. One fan after another about 15 ft. apart. 9:15 p.m., Sunday. Still alive. We had to come back with our fans. 10:25 p.m., Sunday evening. We all had to come back.

"We can't move front or backward. We can stand it with our fans until Monday morning. 2:15 a.m., Monday morning. Am still alive. We are cold, hungry, weak, sick and everything else. Alfred Howard is still alive. 9:15 a.m., Monday morning. Still breathing. Something better turn up or we will soon be gone. 11:15 a.m. Still alive at this time. 12:44 p.m., Monday. Our lives are going out. I think this is our last. We are getting weak, Alfred Howard as well as all of us."—The young miner evidently succumbed before he could write good-by.

The Value of Zones in Stopping Flame

By Joseph Virgin*

There has been a good deal of comment the last two years because of the flame from dust and gas explosions passing over wet zones, causing many European engineers to criticize if not to condemn the spray method in its entirety.

Quite a number of mining engineers have been advocating zones of micaceous shales and schistose. It is not the purpose of this article to verify any of these gentlemen in their findings or statements; however, there seems to be good and sufficient reasons why flame should cross these places. In fact it would seem more wondrous to me if it did not. Furthermore, I can hardly bring myself to believe that zones of water, shales, or pure mica schist would guarantee any degree of safety. Therefore, I believe "the game is not worth the candle."

As an earnest advocate of the plan of dampening dust in any way possible, I certainly have not advocated wet zones. Nothing less than dampening all the dust, and keeping it damp will suffice. It seems to me that the enormous force generated by an explosion of dust will propel the flame across any reasonable length of zone, be it shale or water. Trying to find the value of such a force I have arrived at some reasonable conclusions even though they are crude. I trust they will cause others to investigate.

Let us consider a mine heading 1000 ft. long and 6x10 ft. in section. Such an opening would contain 60,000 cu.ft. of air, and each cubic foot would contain 0.017 lb. of oxygen. The entire 1000 ft. of entry, therefore, would contain 1020 lb. of oxygen. This oxygen will find plenty of dust for carbon, and for its expansive value we can compare it to the expansion of gunpowder, as the air contains the only source of oxygen for an explosion.

For the sake of comparison let us take ordinary gunpowder which contains about 40 per cent. of oxygen, there the quantity of powder necessary for 1020 lb. of oxygen is

$$\frac{100 \times 1020}{40} = 2550$$

lb.; consequently, 2550 lb. of powder would seem to have the same expansive force as the 60,000 cu.ft. of dusty air. Professor Abel estimates the pressure developed by blasting powder to be 43 tons per square inch. Estimating on this basis at the face of the heading, we would have a total pressure of

$$60 \times 144 \times 43 = 371{,}520$$

tons. Also 86,000 lb. pressure per square inch equals 12,384,000 lb. per square foot. This is quite a respectable pressure which would move with a great velocity.

Velocity of the Flame

Let us try, therefore, to discover what the velocity is: Now the velocity $= V = \sqrt{\frac{PA}{KS}}$. Assuming a zone of 1000 ft., and considering that $K = 0.0000000217$, then V would equal more than 100,000 ft. per minute; the flame would cross the wet zone in about 0.6 second.

Of course, if the roof rock, the sides and bottom were thoroughly wet, it would retard the flame somewhat; but I do not believe the same could be said of a dry, dusty zone of micaceous shale. I feel safe in saying that few of the advocates of such a plan would care to stand in a dusty roadway across a zone of that nature.

Captain Desborough, of the foreign expert commission, who visited these states last year, said: "Before a person can call a dust flame an explosion, it must have a velocity exceeding that of sound." Yet here we have a velocity 100 times as great, and some of our friends want to call it rapid combustion. While every mining man of experience will gladly welcome any method of arresting these flames, yet for one I firmly believe that keeping the roadways in a solid condition and the roof and sides damp is a much safer way than to have dusty zones of mica schist.

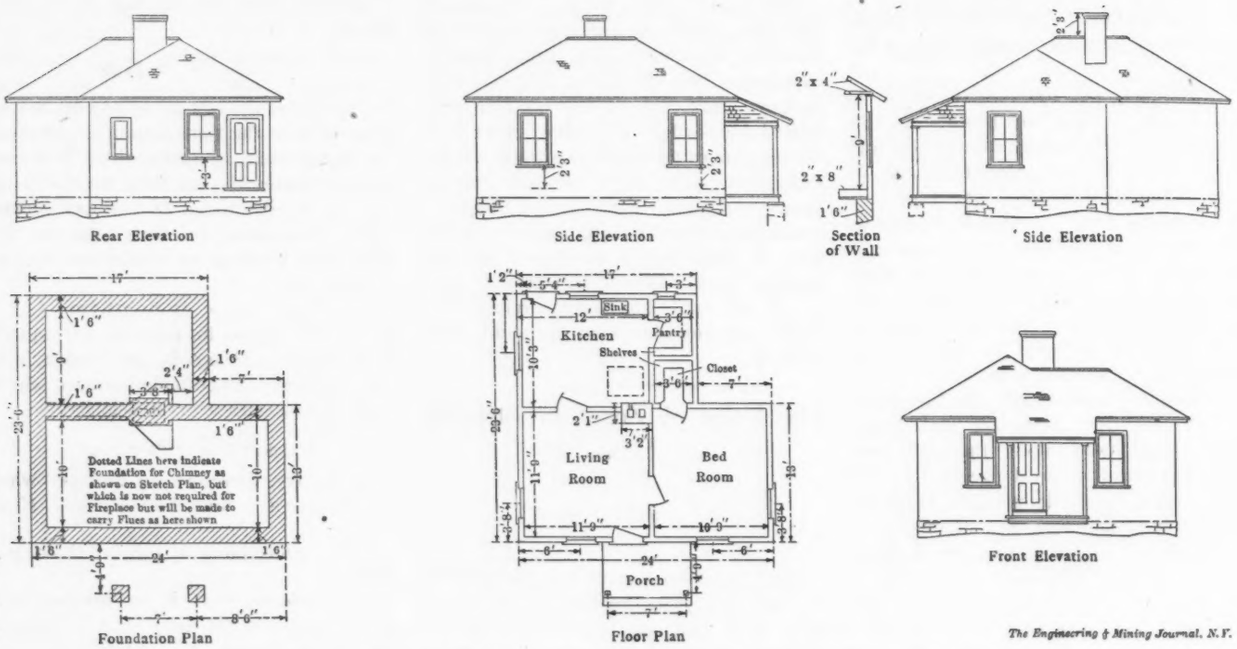
*Mine superintendent, Plymouth Coal Company, Plymouth, W. Va.

The number of coal-cutting machines employed in the mines of the Nottingham district of England has increased from 154 machines in 1907, to 173 in 1908 and 200 machines in 1909. The power used is almost equally divided between electricity and compressed air. The latter is considered safer, but electricity seems to have the advantage in cost. Considering all of the coalfields of England, however, compressed air is most used, being in the proportion of nine to seven to electricity.

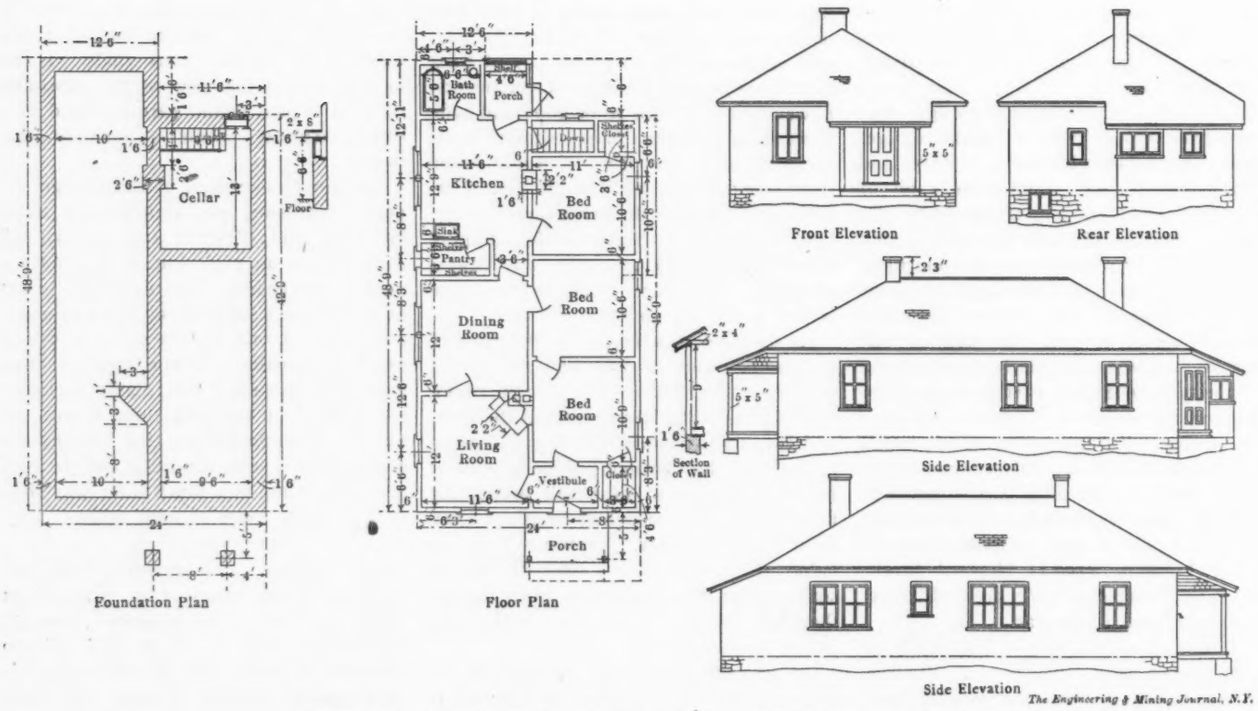
The Design of Small Houses for Coal Mining Towns

The majority of coal-mine operators today are devoting considerable attention to the sociological side of coal mining. In this connection the provision of better houses for the employees is a matter of importance. It is not any great philanthropy on the part of mine owners that has prompted the present attitude. Quite the contrary is true, for the move has been prompted by the belief that better houses mean better workmen and more contented men. This in turn means higher efficiency, greater output, more profit.

The accompanying drawings show two styles of houses constructed by the Carbon Coal and Coke Company at its mines in southern Colorado. The designs, as shown, are so complete that no description is necessary. Houses of this kind when properly built and then painted in a variety of harmonious colors, rather than all roof-red, or sky-blue, present a respectable appearance and materially increase the attractiveness of a mining town.



GENERAL PLAN AND ELEVATION OF A THREE-ROOM HOUSE DESIGNED FOR A COAL CAMP



DETAILS AND DESIGN OF A SIX-ROOM HOUSE FOR COLORADO COAL MINERS

Peat as it comes from the bog usually contains from 85 to 90 per cent. moisture all of which must be evaporated before burning.

The Utilization of Anthracite Culm for the Generation of Electricity

By John Clark*

The great culm banks which surround the mine openings in the anthracite coal regions have usually been looked upon by persons not fully acquainted with all the conditions, as ideal sites for the generation of electricity, because the culm can be obtained for little or nothing. Although grates have been devised for burning this cheap fuel, the problem which confronts the operator of a plant located on such a site is to obtain water. The water that is used in the mines and in the breakers, and finally finds its way into small streams, is so charged with dirt and sulphuric acid as to render its use for boiler-feed purposes impossible. In fact, if an ordinary coal shovel were thrown in the water and the site revisited in a year, no sign of the shovel could be found, the iron having been completely dissolved by the acid in the water.

In not a few locations the water is very much more expensive than the fuel, so that while ordinarily one would expect that power plants located where fuel is cheap could manufacture electricity at a very low cost, such is not the case, a kilowatt-hour of energy being manufactured in large cities remote from the coalfields for considerably less oftentimes than it is manufactured at the mining plants.

As a result of the scarcity of water, most of the plants located in the coal regions operate noncondensing. This practice is also partly due to the cheapness of fuel. However, with the use of a steam turbine the best economy is obtained when the plant operates condensing. Despite the cheapness of fuel, it is possible to realize a marked economy with simple engines if these be operated condensing. The problem, however, is to obtain the necessary water for this purpose, and it is surprising that more use is not made of the cooling tower for husbanding the supply. Plants already in operation using circulating water drawn from muddy streams, carrying grit and sand, avoid the cutting of pump pistons and cylinders by using cooling towers.

The Cooling Tower Can Be Employed to Advantage

The water coming from the condenser in a heated condition is spread out in such a way as to bring the greatest surface in contact with the greatest quantity of air, so that evaporation takes place quickly and effectively. The cooling tower, of course, does its best work when the surrounding air is dry, but radiation does part of the cooling during the winter season, as does also the contact of cool air with the heated water. Nevertheless, the bulk of work is due to evaporation. Manufacturers of modern cooling towers obtain the necessary circulation by means of fan blowers, and a fan tower is to be commended where the quantity of heat to be removed is great, or where the duty is especially severe in the hot summer months. But the cost of power necessary to operate the fans, and the wear and tear, due to moving parts, has resulted in the production of natural-draft fanless towers. The open fanless tower not only dispenses with the fans, but does away with the tank structure entirely. The apparatus is open on all sides to the air, and the natural currents are utilized.

Where sufficient ground area is available, as at the mines, this type of tower, which is simple in construction, easy of access and which requires a minimum of attention, should prove efficacious. The tower can be used in connection with either jet or surface condensers, but with the former system an aditional pump must be employed to deliver the discharge from the air pump to the top of the tower. A surface condenser is preferable if the tower is located on the roof or otherwise elevated since the discharge and suction columns balance below the tower, making the work of the pump that due solely to the hight of the tower itself. The cooling tower has done much to make feasible the operation of steam engines condensing, in places where the cooling or injection water would ordinarily be too expensive or too scarce.

Note—Abstract of article published in *Electrical World*, Dec. 2, 1909.

*Scranton, Penn.

Another View of the St. Paul Mine Disaster

By L. F. Wilson*

The St. Paul mine is quite distant from any city or village with a proper fire-fighting apparatus, and the mining company had no means of taking care of such an emergency itself. The shafts and galleries of a large coal mine have millions of feet of timber in the supporting structures and this timber is rendered peculiarly inflammable by the accumulations of coal dust. The mine in question was operated in a modern way and its officials were of the best. Therefore, what happened to this mine can as well happen in any of the many workings in Illinois and Indiana.

It may be of interest to those who are mystified by the vague and exaggerated daily press reports, to get a description of the nature of the accident which bids fair to being the worst or, at least, among the worst which has happened in the United States. The installation of machinery and other equipment at the Cherry mine is typical of all the bituminous mines in Illinois and Indiana. These mines are not gaseous and there is ordinarily no danger from open lights. The main shaft, which extends down through three working levels, is served by two hoisting cages which are operated from the same drum in such a way that one cable is hauled in when the other is paid out. The cages do not go beyond the second level and a false floor closes the main shaft at that point. An air shaft which extends straight down to the third gallery is served by a fan running normally as a blower and discharging into the air shaft. This shaft is also used for a hoist from the third to the second vein. At the second gallery it was the custom to haul the coal across to the main shaft from whence it was brought to the surface. The men were carried up and down over the same course.

*4544 Lyman avenue, Chicago, Ill.

The Hoisting Arrangement

The winding drum for the main shaft with its engine is situated in an engine room about 100 ft. from the mouth of the shaft. The engine is a duplex simple machine with a link-reverse motion. The cylinders are approximately 16x30 in. and are set quartering. The engineer sits between the cylinders and operates by bell signal only. The air-shaft hoisting engine is somewhat smaller and is in a room by itself about 300 ft. from the main-hoist engine room. Both engines, as well as the fan engine, are operated with steam from the central boiler plant. The signals used at both hoists is the pressure-bell system. That is, an air tube so arranged that the stroke of a hand air pump at one end will force up a piston clapper to ring a gong at the other. The gong rung from one end is answered from the other.

Engineer Cowley at the main hoist and engineer Raisdell at the air-shaft hoist have been severely censured by some of the miners rendered hysterical in their grief. As a matter of fact, engineer Raisdell, who operated a cage which never comes to the surface, raised and lowered his cage, at the time of the fire, as if nothing had happened and when the signals ceased to come he went over to the main hoist where Cowley was working, to assist if possible. The latter was also running the engine in response to the signals as usual. It might be stated here that the signals can only be given from one of the galleries in the mine and not from the cages themselves.

When smoke was seen issuing from the main shaft a party of four men started making trips down to assist if possible in getting the miners out. On the third or fourth trip down the engineer was signaled to hoist and then to stop, next to lower, then to hoist with all speed, he then got a bell to stop and to lower again, then no more bells were heard. Unable to decide what to do and

practiced in obeying the signals, he refused to haul away for some moments, perhaps a quarter of an hour, and when at last he did hoist the cage, 11 men were brought up dead, including those who had gone down.

The solution of the signal confusion was probably this: The cage was started up on the last trip, when a miner who wished to get up with the rest pulled the bell to stop and bring the cage back; after he got on, the cage was started up again, when another poor fellow came along and seeing the cage going up without him, brought it back in the same way. By this time the fire had caught them and no more signals could be given. It is probable that if the cage had been brought up regardless of the signals, ten of the men would have escaped. (The last one would have been left behind.)

Shortly after the fire was discovered, as is the custom, the fan was reversed. This is done in order that fresh air will be sucked down the main shaft upon the miners waiting to be hoisted instead of forcing the gases and flames toward the main shaft, as would be the case if the fan were kept running normally. In this case, however, the reversal of the fan probably caught many men in the act of mounting from the third to the second level in the air shaft. In any case it made little difference as they would have been killed in the higher level with their fellows.

As soon as the cage of dead men had been hauled up, and it was seen that the flames would soon be shooting out, a quick decision was made to seal the shafts. Railroad rails were laid across the top and boards were placed to hold the sand shoveled on top. The air shaft was sealed by blocking the fan intake with bricks secured by tearing down its housing. Many classed this action as murder of those still in the mine. As a matter of fact, however, if this course had not been taken, the flames would have burned away the timber structures and cave-ins, which would have closed the mine for months, would have resulted. Not even the bodies of the miners could have been recovered had the fire not been smothered by the covering of the only exits.

At the present writing, the mine has not been opened. Several attempts to do so have resulted in "blowing up" the fire. When entry is made, the writer predicts that it will be found that some of the men now dead in the third vein had lived for several days after the fire was discovered. One man now in that part of the mine was confined in a French mine for five days under similar conditions.

Considering the subject of better fire protection, it is suggested that coal mines be protected by arranging worked-out rooms as havens of refuge, by fitting them up with doors, food and water, and running to them pipes from air compressors so that they could be supplied with air under a slight pressure sufficient to keep out the smoke and gases and for breathing. Enough of these should be fitted up to allow of their quick occupation and it seems certain that, in a case like this, many lives would be saved.

Coal-Mine Accidents are Due to Violation of Mine Laws

Chief Mine Inspector Hanraty, of Oklahoma, has issued a circular with the following words of caution: It is my opinion that the cause of the many fatal and serious accidents in the mines of Oklahoma is through the carelessness, incompetency and the inexcusable ignorance of the mining law, by some superintendents, pit bosses, fire bosses and miners, who for the sake of personal gain deliberately violate all laws and destroy not only their own lives, but the lives of their fellow workers. It is hard to understand, why so many coal-mining companies will spend any amount of money for the equipment of mines to make them safe, and employ superintendents, pit bosses, fire bosses and miners regardless of their practical experience in mining.

Rules to Be Observed

No person shall enter the mine until the fire boss makes a report outside of the mine on a blackboard for that purpose, arranged where men can conveniently inspect it. The fire boss shall also make a written report after each examination; if there is any standing gas discovered, he must leave a danger signal across every entrance to such place, and if there is sufficient gas for one place to be dead lined, the whole entry must be dead lined; and no person other than the mine officials, shall pass beyond said danger station until such standing gas has been diluted and dispersed by a current of air, and not by brushing. The dangerous practice of gas being brushed out is positively prohibited. The fire boss shall not allow any person to enter or remain in any part of the mine through which a dangerous accumulation of gas is being passed into the ventilating current from any other part of the mine. The mine must also be examined on idle days or Sundays, if any day men are required to work in any part of the mine. Mine foremen and fire bosses should devote their entire time, during working hours, providing for the safety of the miners and other employees, and should not be required to perform the duties of coal hustlers.

In all mines generating firedamp, and containing dangerous coal dust, the coal company should furnish the pit boss a thermometer, a barometer and a hygrometer, and the fire boss should keep a daily record of the reading of each instrument. He should also keep informed of the conditions of the atmosphere in the different parts of the mine, and when the moisture falls too low, steam should be admitted into the intake air until the mine atmosphere has again come up to the proper standard. As long as the air in the mine is kept at one standard, as regards water vapor, the coal dust will be a minor factor. The air in the mine should sweep the working face in sufficient volume to give at least 200 cu.ft. per minute, per person, employed in each split. Swift air currents are the best as they will not deposit their moisture as fast as slow-moving currents.

Mine foremen and fire bosses should understand and realize the responsibility of their positions. They are charged with the duty of seeing that the mining law of this State is enforced and obeyed. The position of mine foreman is not an easy one, and can never be, as long as three-fourths of the men employed in coal mines are not practical miners, and one-half of them ignorant of the English language. A few years ago mining was a trade, and all the men who mined coal took pride in being skilled miners. They went to work in the mines when they were boys, and everyone was trained to do his work well, but of late years mining has been revolutionized in that respect and mining is becoming a "lost art." When the skilled miners of a few years ago struck for higher wages and better conditions of employment, thousands of unskilled laborers were imported to take their places. The vast majority of these men never saw a coal mine. And, when the practical miner returned to work, he discovered the trade his fathers taught him gone, as the unskilled miner had a system of producing coal with less work (but more danger), than he, and the skilled miner was forced to adopt the same system to compete with them. This unpractical system of mining has produced a lack of discipline, which is startling. There seems first to be little supervision, and second, there is a lack of respect for authority, and disrespect for the mining laws, which were enacted for their protection. The reckless miners, superintendents, mine foremen and fire bosses who wilfully violate the law should be arrested and prosecuted, and should never again be allowed to work in the mines of this State. I must confess these may seem extreme remedies, but it is better to do that than to fill our graveyards with innocent victims and make hundreds of widows and orphans through their ignorance, carelessness and indifference to the laws.

It is not enough that we pay accident insurance or make provisions for the bereaved families. Suffering and bereavement have no money equivalent. Prevention is better than compensation or charity.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl St., New York.

London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada. To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1908 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for October, 1909, *was* 51,000 *copies.*

December 4..... 11,000
December 11..... 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
The Cost of Mining..... 1177
The Nitrate of Soda Position..... 1177
The Garfield Plant..... 1178
Pittsburg Coal Company..... 1178
*Smelting Plant of the Butte Reduction Works.....*A. H. Wethey* 1153
Physiological Effects of High Temperature and Humidity.
George J. Young 1155
Development of Heavy Gravitation Stamps.....*H. S. Denny* 1157
*Sinking Concrete Shafts in Quicksand.
Frederick W. Adgate 1159
Geology and Ore Deposits of Goldfield, Nevada 1162
*Compressed Air Calculation Short Cuts.
Snowden B. Redfield 1163
*Gold in the Philippines.
Henry G. Ferguson 1165
Comparison of the Thermal Properties of Cupels....*C. O. Bannister and W. N. Stanley* 1167
*Improvements in the Dry Air Blast... 1170
*European Method of Entry Timbering in Coal Mines.....*Henry M. Payne* 1172
The Value of Zones in Stopping Flames.....*Joseph Virgin* 1173
The Design of Small Houses for Coal Mining Towns..... 1174
The Utilization of Anthracite for the Generation of Electricity.
John Clark 1175
Another View of the St. Paul Mine Disaster.....*L. F. Wilson* 1175
Coal Mine Accidents Are Due to Violation of Mine Laws..... 1175
Speed of Pelton Wheel.
George J. Henry 1179
Peat in Canada.....*Eugene Haanel* 1179
Smelting Practice of the Tyee Copper Company.....*George W. Maynard* 1180
Air Compressor Valves....*S. B. Redfield* 1180
Method for Assaying in Cyanide Plants.
Algernon Del Mar 1180
Lime Emulsion Feeder..... 1180
Fire in London Mine, Tennessee Copper Company.....*N. H. Emmons* 1181
Mining Legislation at Washington..... 1182
William Metcalf..... 1182
The Copper Consolidation as Conservator 1182
Smelting in Bond..... 1182
The Census Schedules for Mines and Quarries 1183
The Smoke Question in Shasta Country 1184
*Repairing a Cast Iron Shaft Lining... 1185
*Rearrangement of Tipping Device for Overstrom Tables..... 1186
*Method of Fastening Screens on Hancock Jigs..... 1187
Check System at the Cabin Branch Mine 1187
Skips Replacing Ore Chutes..... 1188
*Car and Tipple for Headings..... 1188
Personal, Technical Schools..... 1189
Special Correspondence..... 1190
Mining News..... 1193
Markets 1198

*Illustrated.

The Cost of Mining

A book under this title by J. R. Finlay, recently published by the McGraw-Hill Book Company, is undoubtedly a remarkable work. We speak of it in our editorial columns rather than among the book reviews because of the part that we have had in its production and its elucidation of principles that we have emphasized during many years. About six years ago we inaugurated a discussion of the cost of mining, which became Mr. Finlay's inspiration. During the last two years he contributed to our pages a noteworthy series of articles that form the basis of his present work, but he has greatly elaborated and added to them, and has handled an extremely intricate subject in a masterly way. H. C. Hoover in his "Principles of Mining," published recently—another masterly work—has treated of the same fundamentals. Mr. Finlay's book—a natural supplement to Mr. Hoover's—applies the principles in a discussion of the cost of producing coal and the metals, and an analysis of the affairs of many of the great mining companies. While both are distinctly professional treatises, they are written especially with a view toward the commercial side of mining, and if our bankers, *entrepreneurs* and promoters will study them there will be an improvement in the status of the mining industry.

Briefly the theory is that the only profit in mining is the difference between the value of the produce and the costs of all kinds, whether they be capital or what are commonly called "operating" charges. Stated thus simply, the theory is self-evident, but in practice it commonly disappears from sight partly because of ignorance, partly because of complexity of the necessary accounting in the case of extensively ramifying enterprises, and partly because it does not suit stock-jobbing purposes to look the problem squarely in the face. We think the last is the predominant reason.

Mines are a great form of wealth. From the investment standpoint many mines are as secure as real estate in the city of New York, but few except those who are expertly engaged in mining know this, and 99 per cent. of the bankers of the country would look askance upon Calumet & Hecla stock as security for a loan. Their attitude is due primarily to ignorance and the beclouding of the mining industry by improper promotions. We referred recently to the operations of a certain class of promoters as the sore upon the industry, but it is the operations of a higher class that constitute the real disease. When the common over-valuation of the majority of mines for stock-jobbing purposes is exposed, as sooner or later it will be, some of the eminent financiers will take notice, and the mining industry will be established upon a sound basis. The books of Mr. Hoover and Mr. Finlay are powerful contributions in this direction.

The Nitrate of Soda Position

The world's supply of nitrate of soda, which comes almost entirely from Chile, has been increasing, but under conditions which are not encouraging to the producers. For some years past the production had been practically controlled by a combination which fixed the quantity that was to be marketed each year, and apportioned the output to the several *oficinas* which were members of the combine. Last year sales of nitrate fell off decidedly, on account of the general depression of trade in the United States and Europe, and there was much dissatisfaction among producers. The agreement expired March 31, 1909, and was not renewed. Most of the larger companies owned in England and France were willing, but the Chilean companies refused to enter into a new agreement; and since that date there has been no restriction, each *oficina* producing and selling all that it could. The result has been a large output, which has been in excess of the demand, and a resulting fall in prices. In the nine months from July 1, 1908, to March 31, 1909, the production was 29,000,000 quintals, or at the rate of 3,222,000 quintals a month; in the seven months from April 1 to Oct. 31, 1909, it was 29,300,000 quintals, or 4,186,000 quintals a month. This was far in excess of the increase in sales which has been made this year.

The result of the light trade of last year and the present conditions is shown in the reports of a number of English companies operating in Chile for the year ended June 30 last, which are published in the London *Economist*. The net profits of these companies—eight in number—were £531,105 in 1906-7, but fell to £340,509 in 1907-8 and to £108,501 in 1908-9. Their dividends decreased from £218,730 in 1907-8 to £98,150 in 1908-9; while pay-

ments from surplus fell from £119,415 to £27,914. The present outlook for an improvement is not encouraging.

The present overproduction is largely due to the higher prices obtained through the combination, which made the nitrate business profitable and drew many new producers into the field. It was mainly the influence of these new enterprises, restricted in their quotas by the syndicate, which led to the refusal to renew the combination last year. Moreover, they must be taken into account in any future agreement, should a new one be formed. Under Chilean law a mining concession once granted must be continuously worked, or else forfeited. Should a concession pass into other hands, say by the foreclosure of a mortgage or the bankruptcy of the holder, the obligation to work it continues on the mortgage holder or purchaser. The holders of the new concession must have some share or allotment in any new combination, so that any restriction of production must come chiefly on the older companies. It does not seem probable, however, that there will be a new agreement at present. Meantime the farmers of the world are getting much cheaper nitrate.

The condition of the nitrate industry has been reflected in the course of prices, which are lower this year than ever before, though there has been, as stated above, an increase in consumption over 1908. Thus in New York in the early part of 1908 the quotations were $2.37½ per 100 lb. for spot, and $2.45 for futures; near the close of the year they had fallen to $2.17½ for spot and $2.20 for futures. The current quotation in New York at the present time is $2.07½ for spot and $2.10 for futures; although deliveries in the United States in the 10 months ended with October, increased from 235,850 tons in 1908 to 275,440 tons this year. The increased sales were offset by overproduction to an extent sufficient to make a weak market.

The Pittsburg Coal Company

The stock of the Pittsburg Coal Company, which for a year past had been almost neglected, has recently furnished some sensation on the exchanges. In New York and Philadelphia there has been heavy buying as well as in its home market. The persistent nature of these purchases has led to a belief with many that they come from one source—whatever that may be—and are not such an ordinary demand for investment as sometimes occurs when the property of an industrial company seems to present good opportunities.

The reports as to the buying of the stocks have been various. The favorite one at first was that the buyers were eastern parties who also controlled the Consolidated Coal Company, and this was not set at rest by positive denials from the people most directly concerned. A consolidation of these two companies would form the largest coal company in the United States, with a commanding position both for seaboard and western trade, and this consideration seems to have given rise to the rumors. Another report was that the purchases of stock were in the interest of the United States Steel Corporation, which has recently shown a disposition to increase its ownership of coal which may be tributary to its other operations. Some other rumors have been started but on such slight basis that they seem to be hardly worth mentioning.

The latest news is that a number of large holders in Pittsburg have agreed not to dispose of their interests, believing it best to prevent the control of the company from passing away from its home city. Since this announcement was made, the buying of the stock from outside has almost entirely ceased.

The Garfield Plant

The American Smelter Securities Company in a recent statement to the authorities of the New York Stock Exchange for the first time gave its official indorsement to the stories that have been told as to the high cost of the Garfield smeltery. Indeed, it has outdone all of the unofficial estimates. It says that the Garfield plant is of 2250 tons daily capacity, and its cost has been about $6,000,000. Estimating the annual capacity at 800,000 tons, this is $7.50 per ton of annual capacity, which makes it, we believe, the most costly copper-smelting plant on record.

We understand that the management of the Garfield plant has now overcome about all of its infantile difficulties. It is a source of professional regret that the management of the American Smelters' Securities Company will not permit its officials to contribute any technical articles about the construction and initial difficulties of this plant, and the interesting metallurgical innovations that have been inaugurated, and after trial have been condemned or adopted. The policy of the American Smelters' Securities Company in this respect, like the policy of the American Smelting and Refining Company, is an exemplification of the undesirable principle of secrecy in the arts against which we, and others, have so often declaimed.

It is worth while to direct the attention of our readers to the series of articles on ore dressing in the Cœur d'Alene by Mr. Wiard, that is now running in the JOURNAL. Mr. Wiard has had personal experience in the district whereof he writes and before beginning his articles visited it anew to review the latest practice. Our technical literature has been lately enriched by many importance contributions respecting the art of ore dressing. Most of these have been, however, essentially descriptive. Mr. Wiard strikes a new note in his analytical and critical consideration of the subject, pointing out what has been found good and what bad, and his articles are particularly useful and noteworthy because of his discriminating comments.

The De Beers Company is preparing to reopen on Jan. 1 the Dutoitspan mine, one of its largest diamond producers, which has been closed since early in 1908. The diamond market suffered from a sudden cessation of buying which followed the panic in the latter part of 1907 and the subsequent depression. America is the largest buyer of diamonds, but European purchasing also fell off as the depression of trade extended. As business has revived, the buying of diamonds has been renewed, and the DeBeers Company is preparing to meet the demand. The sale of diamonds, which are almost wholly a luxury, is a good index to the general prosperity.

The accident last week in the London mine, which fortunately did not result in any fatality, calls attention to the importance of three things at least, viz., the danger that lurks in any inflammable building over the mouth of a mine, the usefulness of means for talking from the surface to the underground workings, and the importance of having an escape outlet.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Speed of Pelton Wheel

In the JOURNAL of Sept. 11, 1909, p. 527, appears a note on the speed of Pelton wheels and referring to a rather disastrous experiment by some mining company. We take the liberty of discussing a statement which might otherwise produce a wrong impression.

No name is attached to this article, so that we do not know the authority for the statements there given. The writer evidently found one-third spouting velocity to be the correct peripheral velocity for some particular water wheel. This, however, does not apply at all to tangential wheels of proper design. It is possible to alter the discharge angles of water-wheel buckets so as to get the best efficiency points at different percentages of the spouting velocity, but only at some sacrifice in the maxiinum efficiency obtainable. The best results are invariably obtained where the pitch circle of the wheel runs at the speed of from 42 to 48 per cent. of the spouting velocity. Any wheel which gives a higher output at any other spouting velocity than those falling within these percentages is capable of giving a still greater output and, therefore, greater efficiency, if redesigned to work within these limits.

Mention is also made that the wheel ran faster except when the compressed air was over 100 lb. pressure. To obtain the best results under the conditions where this wheel was used, especially if water storage is of value, it would have been highly advisable to use an automatic device for regulating the size of the stream automatically to correspond with the requirements of the compressor. A cheaper method and the one ordinarily in use in large water-wheel driven compressor plants, is that of providing a large air storage and running the wheel and compressor up to full speed until a large storage of air is obtained at a pressure somewhat in excess of that normally used, when the water is automatically shut off thus stopping the compressor; and when the air pressure falls sufficiently the valve is automatically opened, permitting the wheel and compressor to run at normal speed until the maximum air pressure is again attained. A little more expensive installation, however, will provide automatic means for regulating the stream to the air requirements at all times, and thus upon small plants without considerable air storage prove more effective.

We shall be very glad to know the name and location of the mine which had this trouble, as there is no question but that if they have the water available at the mine the compressor could still be run more economically by water than by electric transmission.

GEORGE J. HENRY, JR.,
Chief Engineer, The Pelton Water Wheel Company.
San Francisco, Cal., Nov. 11, 1909.

Peat in Canada

Reference was made in the JOURNAL of Nov. 20, 1909, to the peat plant now in course of erection on the peat bog recently purchased by the Canadian government. Since this reference is slightly in error, as were some of the Canadian papers, I submit a short description of the plant and process to be employed.

With a view of supplying the fuel-testing plant, now in course of construction, with cheap peat of good quality, the government purchased for use by the Mines Branch a peat bog at Alfred, near Caledonia Springs, Ont., covering approximately 300 acres. This bog has an average depth of 8 to 9 ft., and is a fair sample of the many peat bogs of Canada.

During the past season the bog has been leveled and sampled, and about five miles of ditches have been dug for the purpose of draining, which required the employment, on an average, of about 10 men. A storage shed, blacksmith's shop, office, and the necessary tracks and auxiliary machinery for feeding the peat machine have been installed. The peat machine, invented by A. Anrep, of Sweden, is the one most extensively used in Sweden, Russia, and other foreign countries.

Briquetting forms no part of the process. The *modus operandi* is as follows: The crude peat, as dug from the bog, is put through the peat machine which thoroughly disintegrates and pulps it. After leaving the machine the pulped peat is transported by conveyers and cars to a forming machine, which cuts the peat pulp into bricks 6x4x3 inches.

After air-drying on one side they are turned over and air-dried on the other, then stacked for more complete drying, and finally stocked in a storage shed. The original peat in the bog contains about 85 per cent. moisture, which is reduced by the drying process to about 25 per cent. In this condition the peat bricks are admirably adapted for gas producers, also for domestic purposes, yielding a fine white ash without clinkers.

When in running order this plant will have a daily output of about 30 tons, employing about 12 men during the summer months. The process and machinery employed are in no sense experimental since they are similar to those now in use in many commercial plants of Europe. The peat fuel used in the gas producer at the experimental plant will be supplied from the Alfred bog; the balance is intended to be used in the surrounding villages.

The estimated cost of one ton of air-dried peat at the bog will be about $1.75. This price, together with the cost of transportation for short distances, will make the total cost of peat—to yield a fuel value equivalent to one ton of good coal—considerably lower than that of coal.

EUGENE HAANEL,
Director of Mines.
Ottawa, Ont., Nov. 23, 1909.

Crushing in Cyanide Solution

Will some reader of the JOURNAL be so good as to state what concerns, together with their location, were using concentrators after crushing in cyanide solution before filtering, and also any companies concentrating after filtering, previous to 1904.

New York, Nov. 22, 1909. H. W. F.

Smelting Practice of the Tyee Copper Company

In commenting on my article on the "Smelting Practice of the Tyee Copper Company," in the JOURNAL of Nov. 6, 1909, Thomas Kiddie, now manager of the Northport Smelting and Refining Company at Northport, Wash., has sent me the following important note on the chemical reactions which took place in the reduction of the barite ores:

"The solution of the problem would probably have come sooner than it did, but for the reason that at first I worked on the assumption of being able to flux the $BaSO_4$ with the alumina of the ore (it being a schist) to form aluminates. This did not work out and much trouble ensued by the constant reduction of the $BaSO_4$ to BaS and its precipitation along with the $Cu_2S + FeS + ZnS$.

"However, after getting a suitable silica flux—which we did in purchasing Mullan (Idaho) silicious ore—and high oxidation and keeping the coke down to a minimum, a 42 per cent. copper matte was pro-

duced from a charge consisting of practically two-thirds burnt ore and one-third raw ore. The $BaSO_4$ was evidently reduced entirely to BaS first, as no SO_2 was found in the furnace gases."

This explanation more fully explains the chemical reactions referred to in the original article.

GEORGE W. MAYNARD.

New York, Nov. 24, 1909.

Air Compressor Valves

In the JOURNAL of Nov. 6, 1909, is a description of what purports to be an improvement in discharge valves for air compressors. This article is of special interest to one associated for several years with one of the leading builders of air compressors in the United States, for in it is recognized a step backward into types of construction now used only by those builders who as yet have not been able to improve upon the old forms.

As the article says, air-compressor speeds are limited by the amount of pounding which the discharge valves will stand, and the statement is made that 150 r.p.m. is the usual limit for air compressors of from 4- to 24-in. stroke. This is old-style construction, for at the present day two of the leading manufacturing companies are running air compressors of their design at the speeds shown in the accompanying table. Moreover, these machines are for direct-connected electric drive and consequently these maximum speeds must be continuously maintained throughout the working day, and generally the night also. Furthermore, there is no chance to slow down from time to time when the air pressure is normal, resulting in a slower average speed, as with a steam driven compressor. Such high speeds as these have been made possible only by improvement in valve design and especially in the number of discharge valves used in a cylinder of given size.

MODERN COMPRESSOR PRACTICE.

Stroke, In.	R.P.M.	Piston Speed, Ft. per Min.	Stroke, In.	R.P.M.	Piston Speed, Ft. per Min.
14	250	583	8	300	400
16	225	600	10	275	459
18	200	600	12	250	500
21	180	630	14	225	525
24	160	640	16	200	533
27	140	630	20	180	600
30	130	650	24	160	640
36	107	642	30	135	675

An essential for an air-compressor discharge valve is that it shall have plenty of guiding surface. The valve shown in the cut, accompanying the article referred to, is exceedingly lacking in guiding surface, as it must depend for this upon the guiding pin *B* in the center and the rim of the valve lip.

An examination of modern valves made by first-class manufacturers will show guiding surfaces three, four or more times as great as given by the design under discussion. This is accomplished by a cylindrical sleeve of large diameter replacing the guiding pin. Furthermore, another essential of the efficient discharge valve is to have free air passage around the rim of the valve. Such construction as the alternate ports and grids marked *E* and *F* in the cut, serves to defeat this especially if the grids are of any appreciable width. If they are not of any appreciable width the so-called "guiding portion" around the lip of the valve is just that much cut down. Also with narrow grid bars it is easy to imagine a tendency to wear the valve lip in ridges, thus quickly removing any guiding tendency on the part of the grids.

As shown in the cut, it would also appear that the valve spring, which is of conical form, is altogether inadequate. A successful spring, to stand the strain of long and continued air-compressor service, must have more length than would be possible with the construction shown to give enough elasticity and also greater wire gage to have the proper stiffness.

Next, the claim made for the valve in question that there is effective cushioning above the lip of the rim is rather weak, for this cushioning does not take place until the lip has been lifted up above the top of the ports and begins to enter the shallow pockets in the guide block. The motion after this time is very limited and it is hard to imagine any effective cushioning, especially with the large clearance volume between the valve and guide block. There is, however, some cushion in the chamber *B*, but this chamber is small and without relief to the outside air, so that if the valve were ever positively opened all the way, it would either be against great pressure in *B* or else the air would have to be squeezed out of this space. This squeezing out would tend to hold the valve open due to the vacuum formed by the next downward movement, resulting in delay in the closing of the valve. This effect would be most undesirable, as may be imagined.

Such a suggestion as to make the valve in two parts, that is, by hot riveting the stem in place in the main body of thevalve, is extemely questionable. Any valve made in two parts and held together by riveting is practically certain to break apart in a short time. The severe pounding received by these valves in their every-day, continuous operation is more than such construction would stand. First-class manufacturers in these days are cutting their valves from solid material in order to do away with just this feature. This is true even where some of the builders do use a valve with a small stem for light service, such as poppet inlet valves for small machines.

There is one feature in regard to this valve which has a little to commend it, and that is, that the guide being entirely free from the cap and held down only by a spring, the difficulty of exactly alining the valve guide with the seat is done away with. However, when the cap and guide are in one piece, in first-class construction, all of the contact surfaces in the cylinder casting are machined at one operation with one suitably formed tool, and then the valve is ground in place with a dummy cap, so that the alinement is as nearly perfect as machine tools can make it.

Comparison of weights with effective areas proves nothing unless it is found that, running side by side in actual practice, the new valve will last as long as the heavier valves with which it is compared. Anybody could make a valve which would be extemely light, as this simply means cutting away more metal. The question is, however, how long will it stand the pounding?

S. B. REDFIELD.

New York, Nov. 12, 1909.

Methods for Assaying in Cyanide Plants

W. H. Seamon, as quoted in the JOURNAL Sept. 25, 1909, p. 608, mentions a method using aluminum and sulphuric acid to precipitate the gold and silver from cyanide solutions. I have been using aluminum but in a different way. Aluminum sulphide, Al_2S_3, is made by fusing lead, sulphur and aluminum in the proportion to satisfy the equation

$$3Pb + 3S + 2Al = Al_2S_3 + 3Pb$$

The Al_2S_3 forms a slag and may contain a little lead which does no harm. The aluminum sulphide decomposes water evolving sulphuretted hydrogen. It will keep in a stoppered bottle for any length of time.

I take 6 A.T. (175 c.c.) of solution, acidify with sulphuric and boil to destroy all the free cyanide; then add a little Al_2S_3, the gold and silver immediately precipitating as sulphides; filter, dry and scorify or run down in a crucible, cupel and weigh. The commercial use of Al_2S_3 is open to the same objecton as aluminum, i.e., the solution must be acidified.

ALGERNON DEL MAR.

South Pasadena, Cal., Nov. 15, 1909.

Lime Emulsion Feeder

A description of a machine designated as a lime emulsion feeder appeared in the JOURNAL, Nov. 20, 1909. We wish to advise that U. S. Pat. No. 552,092, issued December 3, 1895, covers this machine entirely, and it is known as the Ayton intermittent thick pulp extractor, of which we are the sole manufacturers.

CHALMERS & WILLIAMS, INC.

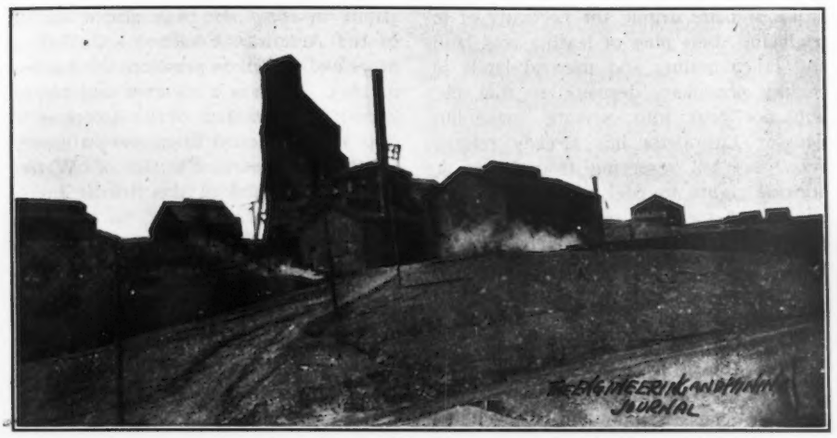
Chicago, Ill., Dec. 1, 1909.

Fire in London Mine of Tennessee Copper Company

By N. H. Emmons*

Following are the facts which have been much exaggerated by the daily papers regarding the fire in the London mine of the Tennessee Copper Company, near Copperhill.

The mine ore bins caught on fire at about 3:30 p.m., Nov. 29, from sparks thrown by a locomotive. The building being constructed entirely of wood, and being very dry, the fire spread rapidly and water could make no impression upon it; the flames rushed to the top of the breaker house, about 120 ft. high, and consumed the entire building in a short time. The crusher, 24x36 Blake type, fell from a hight of about 75 ft, demolishing the engine that was directly below it.



TYPE OF INCLOSED SHAFT AND CRUSHER HOUSE AT TENNESSEE COPPER COMPANY'S MINES

Shaft Set Afire from Falling Burning Timbers

The London shaft is inclined 74 deg. from the horizontal, and the timbers falling from the crusher house set the shaft timbering on fire and gave notice to the men below who, however, had also been notified through a speaking tube that the breaker was on fire. There were 54 men in the mine, of which 12 were on the fifth level. All of these men climbed up to the fourth level and four to the third, the other eight taking refuge in a drift so as not to be overcome by the smoke from the falling timbers. The 46 men were taken out through an open cut which had been a ladder way, but from which the ladders had been taken out on acount of blasting. Ladders were put into this open cut and the 46 men taken to the surface without having experienced any ill effects from the smoke. The four men from the fifth level claimed to have called to the others to follow them and thought they were doing so, but the other eight men must have become panic stricken, for they did not follow.

The smoke soon filled the upper levels, except at the open cut, to such an extent that no one could go down for the imprisoned men, and work was started on the first level putting in a brattice at the crosscut to the shaft, the shaft being about 100 ft. in the footwall at the first level and 300 ft. at the fifth level. As soon as the brattice was put in this level cleared rapidly, and the fresh air blowing down from the winzes to the second level cleared that up, but more slowly. It was found impossible to put a brattice on the second level on account of the heat and smoke. A compressed-air line was brought in from the Burra Burra mine, about a mile away, using partly an air line and partly a water line, already in, the pipe being laid to the open cut at the London mine. Fire hose was then attached to the pipe line and taken down from level to level. It was found that the ordinary 90-lb. pressure blew off the connection to the fire-hose, so the pressure was reduced to 50 lb. at the air compressor. This hose was carried down from level to level and men lowered through winzes with ropes as soon as they could stand the heat and smoke.

OPEN CUT AT LONDON MINE THROUGH WHICH MEN WERE RESCUED—LADDERWAY SHOWN AT THE LEFT

Oxygen Helmets Not Used

The United States Geological Survey sent the equipment of oxygen helmets from the Knoxville, Tenn., station on a special train furnished by the Louisville & Nashville Railroad Company; Mr. Ramsey, in charge of the Knoxville station, came to instruct rescuers in the use of the helmets. By the time the relief reached the mine, which was between 5 and 6 p.m. on Nov. 30, the air was clearing up rapidly and it was found that the men could stand the smoke without the use of the helmets. They were tried, but the men, never having seen them before, were afraid to use them.

Three men were lowered to the fourth level at about 10 p.m., and reached the imprisoned men at 11:30. They found them in a small stope where there was running water from a diamond-drill hole, the men having barricaded the drift to the stope to keep the fumes out. The men were all in good condition and naturally very glad to see their rescurers. They were weak from lack of food and from the limited supply of air in the stope, but after having been given something to eat and brought to the surface they felt all right and walked to their homes, about a mile away.

On account of the small amount of burning timber in the shaft, and knowing there was running water on the lower levels, at no time did the management have doubt but that the men would be found alive and in good condition. Great credit should be given to J. V. Bohn, general superintendent of the Tennessee company's mines, and to Gus Shepherd, foreman of the London mine, who did not leave his post until the report had come up that the men had been found and were in good condition; Shepherd worked con-

*General manager, Tennessee Copper Company, Copperhill, Tenn.

tinually for 48 hours. Men, as usual in such cases, volunteered to go into the smoke and a wire had to be stretched around the mine and guards placed to keep back those who wished to go down to the rescue of their comrades. So far as the company is able to determine, the loss from the fire is fully covered by insurance.

Mining Legislation at Washington

SPECIAL CORRESPONDENCE

Senator Dick, chairman of the Senate Committee on Mining, intends to push the bill establishing a bureau of mines, during the coming session. He states that he believes the chances for the passage of the bill will be better during the coming winter than ever before. This is partly because of the occurrence of several serious mining accidents of late which it is alleged could have been avoided by the use of proper precautions. It is the belief of the promoters of the bureau of mines bill that this measure would have tended to advance the use of the proper precautionary measures at the mines in a way that no existing statutes or regulations do. The opinion is that such a bureau would speedily succeed in developing the use at the various mines of the known precautions and safeguards. Whether this opinion is correct or not there is apparently a substantially better disposition toward the bill than in the past. This is considerably aided by the elimination from the senate of Senator Teller, of Colorado, who was one of the most strenuous opponents of the bill and who charged that the measure tended merely to the establishment of Government places and did not provide for any additions or improvements in mining methods, these being worked out by practical men and not by Government employees in Washington. The bill which Senator Dick expects to urge is extremely moderate and will do little more than transfer from the Geological Survey some of its present work, turning this over to the proposed bureau of mines and creating the proper staff for the bureau and endowing it with a few additional functions. This will follow the lines of the Dick bill of the last Congress. Senator Dick believes there will be little trouble in getting action on the measure, particularly as the prospects do not favor much general legislation at this session, thus leaving the way more clear for action on special bills.

The opinion now prevailing in Congress is that no measure radically changing the mining legislation of the country is likely to be passed at this session despite the recommendations which the Secretary of the Interior has made. The Territories are shortly all to become States, it is argued, so that only Alaska will be left and there the conditions require special treatment. Then there is also heard the argument that it is unwise to disturb a system which has existed for many years without having some exceptionally good warrant for so doing. This system is the existing method of disposing of Government coal lands. The view just indicated is taken by influential men in both chambers of Congress and it is apparent that they are prepared to offer determined resistance to any other plans than their own. Opponents of the conservative group are, however, clamoring for additional legislation and are urging the necessity of introducing some plan of leasing coal lands and other mining and mineral lands including phosphate deposits, so that they will not pass into private ownership. Senator LaFollette has already reintroduced his bill reserving from entry the mineral rights to coal and other materials mined for fuel, oil, gas, or asphalt, underlying the public lands of the United States and providing for the sale of surface rights and the leasing of the mineral rights upon these lands. Mr. LaFollette's Indian coal-land bill has already been introduced in the same form as in last Congress, and its author proposes to push these two measures, but with little hope of securing immediate action upon them.

William Metcalf

William Metcalf, for many years a high authority in the steel trade, died at his home at Pittsburg, Penn., Dec. 5, aged 71 years. He was born in Pittsburg in 1838 and graduated from the Rensselaer Polytechnic Institute at Troy, N. Y., in 1858, returning immediately to his native city. His first active employment was in the Fort Pitt foundry and after two years there as a subordinate he was made foreman of the gun department in which many of the heavy Rodman and Dahlgren guns used during the Civil War were cast. About 1865 he left the Fort Pitt works and entered on his own account into the manufacture of crucible and other special steels, in which he acquired a high reputation. He continued this work under the firm of William Metcalf & Co., until about 1882, when his works were merged in the Braeburn Steel Company, which he organized and of which he remained president until his death.

Mr. Metcalf was well known as an engineer as well as a steel manufacturer, and was a constant student of methods and practices in his business and of the uses to which steel is applied. He made many experiments on the manufacture and properties of steel, and the results of some of these were embodied in a notable paper written by him some 20 years ago, and published in the *Transactions* of the Institute of Mining Engineers. This paper attracted wide attention both in this country and Europe, and not only led to much discussion, but also to the starting of investigations which brought about important changes in steel manufacture and in the treatment of the metal in forges and rolling mills. Besides the paper mentioned he wrote many technical articles and several books on the subject, which are considered standard authorities. He was always open in his methods and believed thoroughly in sharing the results of his work with his fellow engineers and manufacturers.

Mr. Metcalf was for many years a member of the American Institute of Mining Engineers and was president of the Institute in 1880. He was also a member of the American Society of Civil Engineers and served as president of that body in 1893. He was a member and for two years a vice-president of the American Society of Mechanical Engineers; a member of the Engineers' Society of Western Pennsylvania and of the British Institution of Civil Engineers. In his native city he had many interests and was highly respected, taking a prominent position on important public occasions.

The Copper Consolidation as Conservator

Promoters of the deferred copper combination have invented a seductive argument, says *The Evening Post*. The combination they propose to effect is not like other combinations. It is in the interest of "conservation." There is a popular demand that the natural resources of the country be conserved. Well, this combination will greatly help. This country produces, say, 60 per cent. of the world's copper supply. It consumes only a third, more or less, of what it produces, and the balance is sold to foreign consumers. Why should foreigners be permitted to consume our copper at 12 or 13c., when a combination can be formed to make them pay 14 or 15c.? Every pound of American copper mined and sold is gone forever out of the country's natural resources. Why should it be given away?

Smelting in Bond

In a letter to the collector at Perth Amboy, N. J., the Secretary of the Treasury writes that: "Section 24 of the tariff act of Aug. 5, 1909, relating to the smelting and refining of ores and crude metals in bond, provides that the special charge against the bond may be canceled upon the exportation of the actual amount of lead produced from the smelting or refining, or both, of such ores or crude metals.

"In view of this provision of law, it now becomes necessary to assay base bullion for the purpose of determining the percentages of lead contained therein as well as to assay ores for the lead content, and you are, therefore, directed to have all base bullion which is imported and placed in a bonded refinery assayed for the lead contents."

The Census Schedules for Mines and Quarries

SPECIAL CORRESPONDENCE

Census Director Durand has completed the special census schedule which is to be used generally in taking the census of mines and quarries for 1910. This schedule has been anticipated with much interest by mining experts and operators, because of the unsatisfactory character of the schedule used in the last census period and the feeling that many of the questions then asked were unreasonable or unduly inquisitorial.

The new schedule has been materially modifield as compared with its predecessor of 10 years ago. It will be supplemented by a series of special schedules relating to the various kinds of mining products. The work in this respect is to be carried on in close conjunction with the Geological Survey and the schedule has been shaped under the advice of the latter bureau to some extent. The supplementary schedules for the various kinds of mining products are not yet completed but will be in hand within a very short time. The general schedule has not yet been published but is now in final form.

GENERAL DESCRIPTION

Question 1 calls for a description of mine or quarry: and adds, "If the information given on this schedule embraces more than one mine or quarry, give the name and location of each on supplemental schedule."

The data called for are: The name of mine or quarry; name of operator and, if operator is not owner, the name and address of owner; also the number of mines or quarries covered by this report. The location of mine or quarry; the post-office address of general office. The period covered by the report; the character of organization, as individual, general partnership, limited partnership, incorporated company, cooperative association, or other. The number of proprietors and partnership members, if a nonincorporated organization; the number of proprietors, if any, regularly performing manual labor in or about mine or quarry; the number of stockholders, if an incorporated organization, on the last day of the period covered by report.

PARTICULARS OF WORKING

Question 2 calls for the time in operation and hours worked, specifying the number of days in operation during the year. Days when shut down for repairs, or for other causes, and there was neither development work nor production, should not be included. Number of hours normally worked by wage earners per shift and per week. (The prevailing practice followed during the year, without attempting to indicate variations from this practice. All that it is desired to know is the practice generally prevailing in respect to the hours of labor of employees.)

CAPITAL AND PROPERTY

Question 3 calls for capital invested and area of mineral and other lands, including amount of capital, both owned and borrowed, invested by operator, but not including securities and loans representing investments in other enterprises. Mineral and other lands: Number of acres owned or leased by operators, including only lands actually pertaining to the mining property covered by this report, not undeveloped lands elsewhere owned by the same operator. The answer should give in detail mineral or coal lands (acres); timber land not included above (acres); other land (acres); total (acres), showing all owned by operator; held under lease by operator; sublet to others.

EMPLOYEES

Question 4 calls for salaried employees; number Dec. 15, 1909, as per pay roll. If data are not obtainable for that day or month, the data for the nearest representative or normal day, stating day and month, are to be given. The answer should specify: Salaried officers of corporations; superintendents and managers; clerks, stenographers, and other salaried employees; total number, specifying whether men or women.

Question 5 calls for wage earners, including employees paid by ton, car, yard, or other unit. The answer should give the number, Dec. 15, 1909, as per pay roll. If data are not obtainable for that day or month, data are to be given for same day as for inquiry 4. Answers should include all persons working in connection with mine or quarry, whether employed directly by owner or working for lessee, contractor, or other. Include overseers and foremen receiving wages and performing work similar to men over whom they have charge; those whose duties are wholly supervisory should be reported under second item of inquiry 4. The answer should give separately those employed directly by operator, as engineers, firemen, machinists, carpenters, and other mechanics; miners, quarrymen and stonecutters; miners' helpers (16 years or over); all other employees (16 years or over); boys under 16 years; total employed directly by operator. Also those employed otherwise, as by contractor, etc. Finally the total employed directly and otherwise, specifying whether under ground or on surface. The number of women, if any, employed in or about the mine or quarry, and included above, should be stated.

Question 6 calls for wage earners, including employees paid by ton, car, yard, or other unit: Number, as per pay rolls or time records on the 15th of each month of the period covered by report. if data are not obtainable for that day, data for nearest representative day to be given, specifying those employed directly by operator, and employed otherwise, as by contractor, etc.

Question 7 calls for salary and wage payments: Total amounts paid in salaries and wages during the year covered by this report. Wages to be net wages, after deducting charges for supplies furnished by the company to miners or quarrymen and stonecutters, such as explosives, lamp oil, blacksmithing, etc., as well as charges for power, hoisting superintendence, etc. Amount paid for contract work not to be included, if not done by the regular employees; should be reported under inquiry 9 The answer should give: Salaried officers of corporations; superintendents and managers; clerks, stenographers, and other salaried employees; wage earners, paid by unit of time, ton, car, foot, or yard; include payments to contract miners compensated by these units; miners and others compensated by share of product, including total amount paid to block lessees, leasers, tributers, and all others performing work for share of product, after royalties charged have been deducted, and finally the total payments. Also amount charged to miners, quarrymen and stonecutters for explosives, lamp oil and blacksmithing charges, etc., as well as charges for power, hoisting, superintendence, etc., deducted from gross wages in computing net wages above, and rate of royalty received by operator if any work done is compensated for by share of product.

MATERIALS AND SUPPLIES

Question 8 calls for materials, supplies and fuel: Total cost of all used during the year covered by the report. This inquiry relates to all materials and supplies of every description and fuel used during the year covered by the report for any purpose in connection with the development or operation of the mine or quarry. It includes the cost of lumber and timber used for repairs, mine supports, track ties, and all other purposes; iron and steel for blacksmithing, rails, frogs, sleepers, etc., for tracks and repairs; renewals and repairs of tools; explosives and oil used directly or sold to employees; water for boilers and other purposes; machinery supplies, etc. The answer should give total cost of all materials (other than fuel) and supplies used during the year; cost of fuel and rent of power; amount paid, if any, for freight on above which has not already been included; total cost of materials, supplies and fuel, and freight on same.

MISCELLANEOUS

Question 9 calls for miscellaneous expenses; amount paid during the year for rent and royalties; taxes; contract work not included in answer to inquiry 7, including tunneling, shaft sinking, boring test holes, etc., during the year, if not done by employees hired directly by this operator; rent of offices and buildings,

other than at mine or quarry, use of patents, insurance, ordinary repairs of buildings and machinery, advertising, damages, traveling expenses, and all other sundry expenses. Finally the total.

Question 10 calls for development work, including total cost of all development work during the year, whether done directly by regular employees or by contract.

Power Used

Question 11 calls for power; mechanical power employed in or about the mine or quarry, either owned or rented, including number and horsepower of all engines, motors, water wheels, etc., used for hoisting, ventilating, pumping, or other purposes. The answer should give separately: (1) Power owned, as steam engines, gas engines, water wheels, water motors, and other power, specifying the kind; electric motors. A separate statement should be made of (2) power rented from other establishments, and of the name and address of establishment supplying rented power. Answers should give (3) name of stream or lake from which water power is obtained to generate power, whether direct or electric.

Information to be Confidential

It is understood that all information given will be held confidential. No publication will be made of any individual or corporation report, the statements being used only in making up the totals in each State or other division.

The Smoke Question in Shasta County

Special Correspondence

The executive committee of the Shasta County Farmers' Association has recommended to the association that the modified decree of Judge Marshall, of the U. S. Circuit Court for the district of Utah, be the basis of settlement of the "smoke question" to be made with the Mammoth Copper Mining Company, of Kennett, Cal. To this the association has agreed. The main points of Judge Marshall's modified decree were:

(1) All sulphuric acid arising from the treatment of copper ores shall be neutralized by oxide of zinc or other effective agents, so that no sulphuric acid shall exist in a free state.

(2) That the fumes and gases from the copper furnaces, when freed from sulphuric acid as aforesaid, shall pass through a bag house and be filtered so that such filtration shall result in removing from the fumes and gases all solid matter held in suspension, including copper, lead and arsenic, and solid sulphates emitted from the neutralization of the sulphuric acid in the fumes and gases.

(3) That the gases, after passing through the baghouse, when discharged into the atmosphere shall not contain to exceed 0.75 per cent. of sulphuric dioxide, by volume.

(4) That the gases passing through the baghouse shall be discharged in such a manner that they will be diffused in it so they will not do any damage or injury to crops, trees or other vegetation, or to domestic animals, or cause any inconvenience or discomfort to the complainants, or any members of the family of the complainants.

The decree further provides for means of inspection of the smelting plant by a committee of the growers, from time to time, for the purpose of seeing that the decree is being acted under good faith.

This is virtually an approval of the baghouse plan. In order to make the contract binding between the copper company and the farmers a friendly suit will be brought. The baghouse is to be in operation by next April.

Ballinger on the Coal Land Laws

Secretary Ballinger, of the Department of the Interior, makes the following remarks in his annular report:

As regards new legislation the present coal-land laws respecting the States and Territories as well as Alaska should be supplanted by an act fully meeting existing as well as future conditions. The inducements for much of the crime and fraud, both constructive and actual, committed under the present system can be prevented by separating the right to mine from the title to the soil. The surface would thereby be open to entry under other laws according to its character and subject to the right to extract the coal. The object to be attained in any such legislation is to conserve the coal deposits as a public utility and to prevent monopoly or extortion in their disposition. This may be accomplished either through a leasing system by which the title would remain in the Government under proper regulation and supervision by the Secretary of the Interior or through the sale of the deposits, and in either case with restrictions on their mining and use which would control the minimum output and conserve the deposits as a public utility.

I believe the most advantageous method will be found in a measure authorizing the lease or sale of the coal deposits in the lands, subject to forfeiture for failure to exercise the rights granted, under such reasonable regulations as may be imposed. An exploration period of at least one year upon a permit basis, at a nominal charge, would insure to the applicant the necessary preliminary knowledge upon which to make the lease or purchase of the coal deposits and venture the necessary investment for operation. The maximum unit authorized for this use could safely be made from three to five sections, provided no greater surface rights be granted than will give proper facilities to reach and extract the coal deposits.

In case of failure of the lessees or grantees to open and operate the coal deposits under reasonable limitations and to maintain an output reasonably suited to the deposits, and in case of combinations as to price or limitation of output, title should be forfeited by proceedings in court for that purpose. Government mine supervision would doubtless be necessary to enforce the conditions and limitations under the grant.

The above suggestions with reference to the disposition of coal deposits are equally applicable to the oil and gas fields in the public domain, and similar legislation as to lands containing the same is hereby recommended. Indeed, the very nature of these two important mineral resources requires that their disposition be in terms of quantity of their product extracted rather than that of acreage.

Pending the enactment of new legislation as affecting coal lands, all known coal areas were withdrawn from entry for classification and appraisement through the Geological Survey.

Mount Lyell Company, Tasmania

The Mount Lyell Mining and Railway Company, according to the report of Robert Sticht, general manager, was employing on June 30, 1909, slightly in excess of 1900 men, 942 being employed at the reduction works, 150 in the railway department and 842 in the mines. The number of men employed at the company's Mount Lyell mine was 339; at the North Lyell, 489; at the Lyell Tharsis, 7, and at the Crotty, 7. The extraction of pyrites for smelting and acid-making purposes continues at the Iron Blow open cut. Most of the ore, at the date of the report, was coming from below the No. 4 bench, which consequently necessitates the greater portion being raised by the incline hoist. The top three benches have already reached the limit of their usefulness and are now being permanently battered. Underground work has been resumed in the sixth and seventh levels, where preparations are being made for connection with the extension of the incline hoist.

At the North Lyell mine the most important work has been the completion of the station at the 1100 level and the connection between the main and auxiliary shaft. At the 1000-ft. level extraction continues from five stopes, four of which are still on the first or ground floor. The 850-, 700-, 500-, 400- and 300-ft. levels are all being worked. Open cutting is being carried on chiefly for the purpose of obtaining filling for the underground depletions. At the reduction works four furnaces were in blast, as usual.

Details of Practical Mining

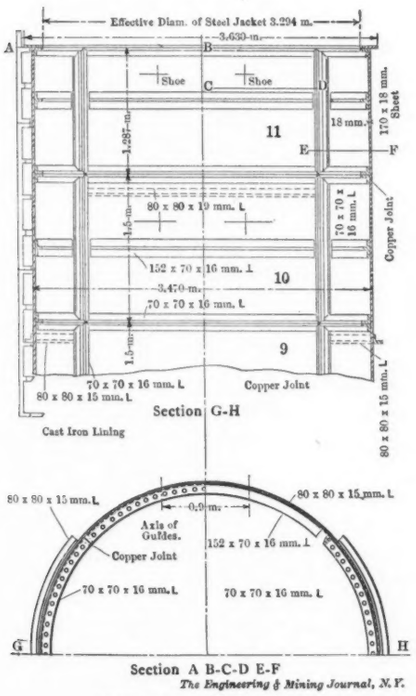
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Repairing a Cast-Iron Shaft Lining

Inspection of the cast-iron lining in one of the shafts of the Harchies colliery in Belgium disclosed a horizontal crack, at a depth of 200 m., from which a number of radiating fissures extended up and down, covering a vertical distance of about 10 m. On account of the leakage

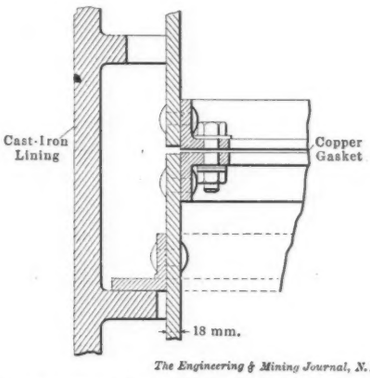


CAST-IRON SHAFT LINING

of water, and because the strength of the lining was in doubt, it was decided to reinforce the lining with an inner jacket of steel and concrete. The method employed is described in *Annales des Mines de Belgique*, Vol. XIV, No. 2.

The inner jacket was composed of 11 rings, each 1.5 m. wide, made of sheet steel 18 mm. thick; each ring comprised four segments, the joints between which were made by angles riveted to the edges of the sheets and then bolted together. A gasket of copper 3 mm. thick was put into each joint. The center of the segment was reinforced by a horizontal ring of T-iron, riveted in place. The sections of the jacket were supported in position by horizontal rings of angle riveted to the outside, which then rested on the interior flanges of the cast-iron permanent lining.

In order to make a water-tight connection between the inner and outer walls, the intervening space was then filled with cement grouting; 29,750 kg. of cement were required for this purpose. Finally, in order to solidify the surrounding strata, cement was injected through eight stop-



DETAILS OF THE HORIZONTAL JOINT AND SEAT

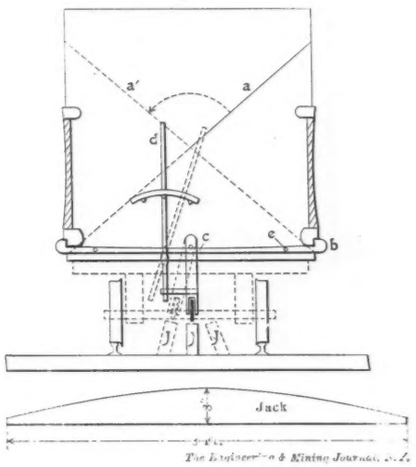
cocks in the walls, after which the inflow of water was greatly diminished. The reduction in the diameter of the shaft necessitated the offsetting of the hoisting guides past the steel jacket; the guides were supported on cast-iron shoes riveted to the plates. The details of construction are shown in the accompanying drawings.

An Improved Chuck Block

Where inside amalgamation is done by plates on the chuck blocks, the difficulty caused by the accumulation of sulphides or other heavy particles on the tops of the chuck blocks may be done away with by the simple expedient of making the upper angle of the block a sharp one, thus insuring a steep slant on all parts of the plate. Daniel McKinley, amalgamator of the Laurentian mine at Gold Rock, Ontario, designed such a set of blocks, making 3 sizes, 4-, 5- and 6-in. respectively, to keep pace with the wear of the dies.

Automatic Trip for Ore Cars

The automatic tripping device shown in the accompanying illustration is used at a number of mines at Iron Mountain, Mich. By means of this device it is possible to dump one car on any one of three piles. This is accomplished by a lever *d* in



CAR WITH AUTOMATIC TRIP

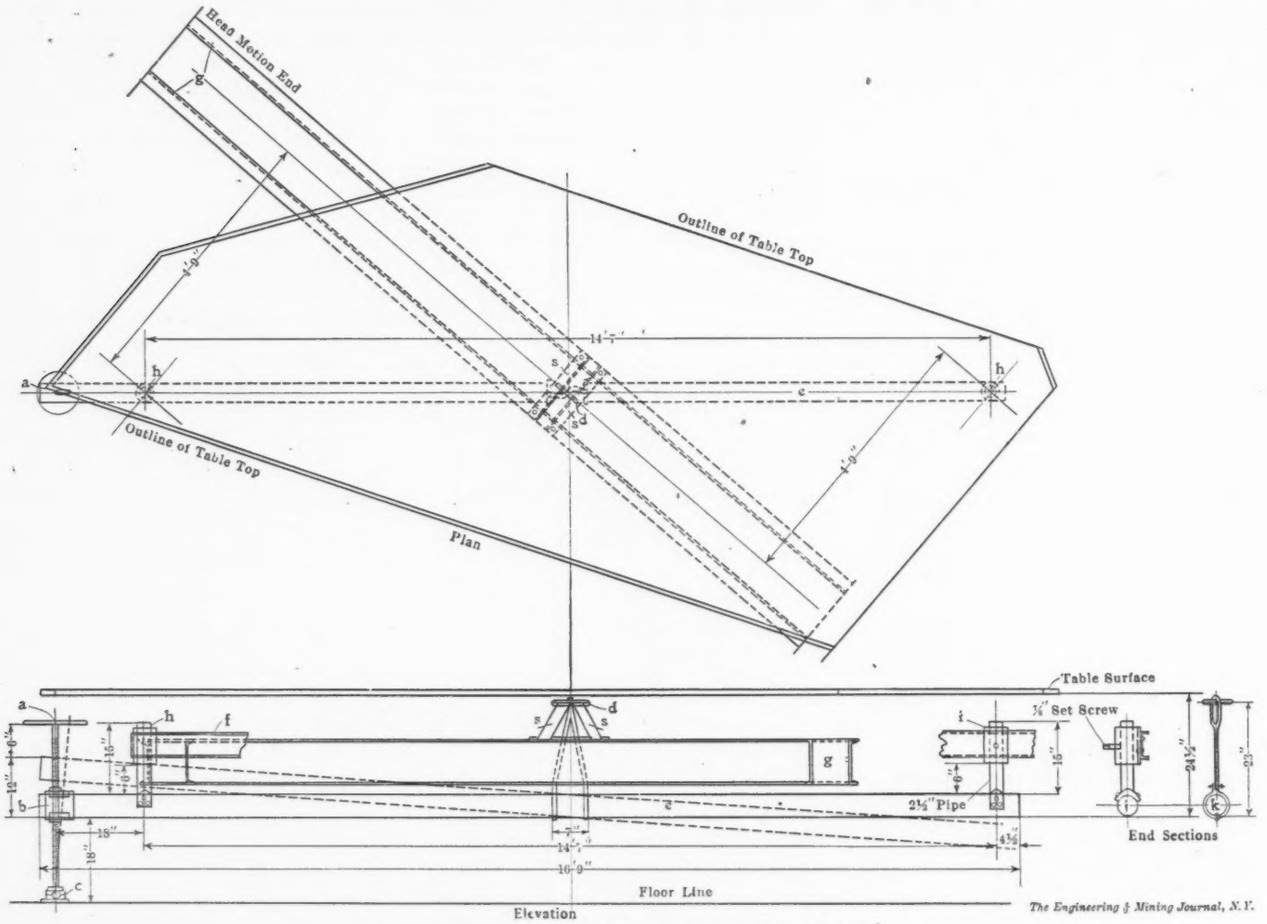
front of the car, which may be set in three different positions. Beneath the car is a small wheel which strikes a jack *j*, set between the rails at any required position on the stock pile. As the wheel passes over this jack it is lifted and the catches *b*, which hold the side doors, are released and the doors opened. The arm of the catch *b* is slotted at *c* to give free movement when the wheel encounters the jack. Similar catches are operated on the other end of the car by a connecting rod through *e*. One jack is set in the center of the track and the wheel strikes this when the lever is in a vertical position. The other two jacks are set a little off center and are encountered by the wheel when the lever is set at one side. The car tender at the skips sets this lever for a certain stock pile before the car leaves the shaft. During the winter months, 100,000 tons of ore are handled per month in this way from a single shaft.

At the Pewabic mine a similar car is used for sending ore to the various bins, but instead of the automatic trip being changeable the side-dump car has a movable bottom *a*, extending from the center to the top so as to deliver the ore on either side of the car, but not on both sides at once.

Rearrangement of Tipping Device for Overstrom Tables

So much force was required to operate the wedges provided for regulating the tipping motion on the Overstrom concentrators installed in the hard-rock mill of the Bertha Mineral Company at Austinville, Va., that a delicate adjustment of the tables could not be obtained easily. They were therefore rendered unsuitable for the close work required. To overcome this difficulty, W. O. Borcherdt, assistant superintendent, devised the regulating device, shown in detail in the accompanying drawing, by which any desired adjustment of the table may be procured by simply spinning a hand wheel which communicates its motion to a 4-in. pipe hung from the frame of the table.

This hand wheel, shown at *a*, is attached to a feed screw and nut from an old 3¼-in. Ingersoll drill. This is provided with a ball joint *c* in the floor socket to allow the necessary play. At *b* there is a short section of 5-in. pipe with slot to retain the nut sleeve and permit slight lengthwise motion of the 4-in. wrought-iron pipe *e*, which is also slotted so that forward, backward and sidewise motion is permitted. The dotted lines show the extreme position for the 4-in. pipe, which has a 6-in. range of motion. Standards of 2½-in. pipe, shown at *h*, connect the 4-in. pipe to a 5-in. channel iron *f*, which partially supports the frame of the table. The 9-in. channels *g* carry the weight of the table to concrete foundations at either side, and support the standards *s*, on which the 1-in. turning pin *d* bears: the 4-in. pipe hangs from this pin by 1½-in. iron straps clamped about it with ⅜-in. bolts. This arrangement is shown at *k*. The old wedge socket of the original device is shown at *i*; *j* is a section of the 4-in. pipe showing 2½-in. pipe standard and method of securing it to the 5-in. channel.



TIPPING DEVICE FOR OVERSTROM CONCENTRATING TABLE

Besides making the most delicate adjustment of the table possible and easy, all but two of the concrete supports formerly required are done away with by this arrangement and much clearance is added under the table.

In mine surveying many errors are made through faulty office work; more, in fact, than through field errors. Two men doing the same work by the same method may make the same mistake. By first calculating by logarithms, and then having the check figured independently by traverse tables, a mistake is practically impossible.

Handling Cyanide Precipitate

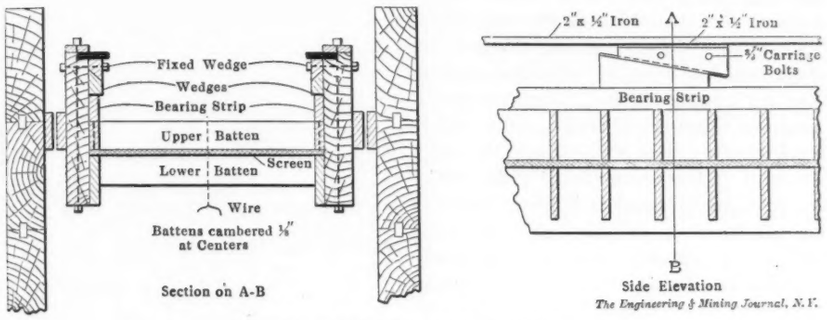
Crushing and fluxing dried gold and silver precipitate is expedited, and dusting and chance for loss minimized by charging fluxes and precipitate together into a mixing barrel. This may be made of an oil barrel of wood or iron, a whisky barrel, or even a beer keg by providing a bolted hand-hole cover for charging and discharging. The barrel can be rotated by being placed loose on two rollers, one of which is power driven; or simple gudgeons, consisting of a 6-in. length of 2-in. pipe with a pipe flange, can be attached to either end of the barrel.

For power driving, one nipple can be made long enough to receive a pulley, or the belt may be placed directly around the barrel. A few short sections of pipe, some pebbles or just scrap iron will assist in breaking lumps of precipitate. A thorough mixing which expedites melting will be effected in a few minutes. If it is desired to add niter, this should be mixed in coarse lumps after the fluxed precipitate is withdrawn from the barrel. A mixture containing a considerable quantity of short zinc and niter, thoroughly ground together, has exploded with a mild, prolonged roar while being heated in the

crucible, lifting the furnace cover and discharging the contents of the crucible into the melting room.

Method of Fastening Screens on Hancock Jigs

The method illustrated in the accompanying drawing is used in the hard-rock mill of the Bertha Mineral Company, at Austinville, Va., to hold the Hancock jig screens firmly in position.



BATTENS AND WEDGING FOR JIG SCREENS

A bearing strip is forced down on the upper battens by wedges. The battens are cambered ⅛ in. at the center, so that when the wedges are driven into position and the battens forced down upon the screen the greatest pressure is exerted at the center where there is the greatest tendency for the screens to become loose. A wire is drawn about each pair of upper and lower battens. This method has given great satisfaction.

Check System at the Cabin Branch Mine

At the Cabin Branch pyrites mine situated about 1½ miles west of Dumfries, Prince William county, Va., a simple and effective method for keeping track of the ore mined by each man is in operation. All stope work is done on contract and each skip raised must pass inspection before being accepted; it is therefore necessary to have an accurate record as to who sends up each load.

To insure this each man or, rather, contractor is designated by a number and on going underground gets from a rack in the shaft house a bunch of brass tags on each of which his number is punched. On the side of the skip a short piece of pipe, closed at the bottom, is so fixed that when the load is dumped the tag, placed in it by the miner sending up the load, is deposited in a box placed to receive it. The inspector takes the tag and files it on its nail on a file hung upon the wall of his office. At the end of the shift he is then able to fill out a record of the ore sent up from each working face, crediting it to the proper men. Short or slaty skiploads are rejected, i.e., not credited to the miners, so that after the first little trouble is encountered on this score. As an aid in the bookkeeping all men on stope work are designated by odd numbers, those on development by even ones. Using tags and an automatic dump as described, the necessity of a tender to follow the skip is done away with.

FORMS FOR RECORDING ORE MINED AND ADVANCE MADE.

First Half Mo.	1		2			15		Totals.
Check No..... Date.....	A. M.	P. M.	A. M.	P. M.		A. M.	P. M.	
Good								
Short								
Slaty								
Location								

First Half Mo.	1		2			15		Totals.
Check No..... Date.....	A. M.	P. M.	A. M.	P. M.		A. M.	P. M.	
Incline								
Raise								
Heading								
Location								

FORM FOR RECORDING SUPPLIES CHARGED AND TOTAL WAGES DUE.

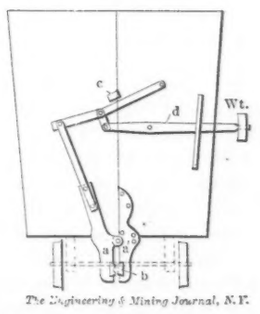
First Half Mo. Check No.... Date.....	1	2		14	15	Supplies.	Total Due.
Location							
Powder							
Fuse							
Caps							
Oil							
Sunshine							

Recording System

The top man at the shaft, or inspector, sends in his report to the office each night, and it is entered into ledgers arranged according to the forms shown. Stope work is paid for by the skip or ton of ore loaded into the skip and incline, heading and raise work by the foot of advance, so separate columns are ruled off for recording these figures The miners furnish their own powder, fuse, caps, oil and "sunshine" (paraffin), for which they sign requisitions as it is issued to them by the commissary. These slips are turned into the office at the end of each day and entered in a book with pages divided as shown for a period of half a month. At the end of each day by reference to the ledgers the exact amount due each man may be determined at a glance. Similar ledges may be used to carry the totals for the entire mine.

Cable Grip for Ore Cars

The accompanying illustration shows a simple and effective cable grip for ore cars where the endless rope haulage is used. The jaw *A* is operated by a system of levers and toggle joint. *A* is stationary. The wearing portion *B* of the jaws is ¾x1½x4 in. and is easily taken out and renewed when badly worn.



ARRANGEMENT OF CABLE GRIP

The lug *C* is fastened to the car which prevents the toggle-joint lever from passing beyond the center. The jaws are held in place on the cable by means of a weight on the end of the lever *D*.

Skips Replacing Ore Chutes

At the Liberty Bell mine, at Telluride, the vein is in a uniform fissure with a pitch of about 53 deg. from the vertical, and carries an ore which is a mixture of quartz with a talcy mud. Chutes were formerly used down which to slide the ore from the upper workings to the main haulage tunnel, but the water made a paste with the mud, sealing the cracks in the chutes, and finally causing them to burst by hydrostatic pressure. To replace these chutes the mine now uses a bottom-dumping skip, designed by S. A. Worcester and Charles A. Chase. This is hoisted, when empty, by an over-balance counterweight.

The skip has a capacity of 11,000 lb. and is attached by links to a cage about 12 ft. above it. The weight of skip and cage is 9000 lb., making a total weight when loaded of 20,000 lb. The counterweight weighs 14,500 lb., thus balancing the cage and skip and ½ the average ore load. Men and timbers are hoisted on the cage when the skip is empty, an effective pull of 5500 lb. being available for that purpose by the over-balance counterweight. The 1⅛-in. plow-steel cable balances itself throughout. The speed is regulated by a brake, a 20-h.p. motor being connected to the sheave for use only when it is desired to lower the skip from its usual stopping place above the ore pocket to the main level for timbers, etc.

The operation of the device is as follows: The filler, or pocket, holds 4 mine cars of ore (one skip load) and is so placed that the skip is in position below the filler when the cage is at the station level. Thus the cage can be loaded or unloaded while the skip is being filled. The skip then makes its trip, dumps automatically, closes its door and returns while the skip tender is dumping cars into the pocket. The skip dumps into a chamber which is divided into two compartments, one for ore and one for waste. From there the material is drawn through finger chutes into a forebay which holds a load for one tunnel car.

Single Skip Compared to Double

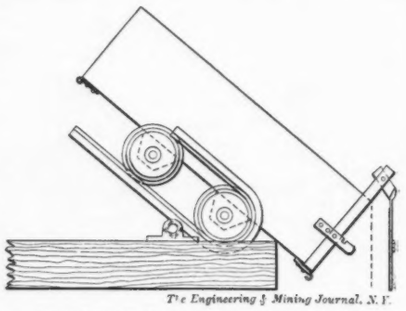
The "peak of load" for two balanced skips is the weight of rope (1150 ft. in this case), plus the skip and ore, because it is necessary when changing levels to hoist unbalanced. A 40- or 50-h.p. motor would be necessary to do this at reasonable speed. The monthly difference in current in favor of the single skip is $120 to $180. Danger resulting from the difficulty of watching two compartments at once is eliminated. The single skip has more than one-half the capacity of the double arrangement as it is always ready to move on signal, while the double-compartment skips are seldom ready to move at the same instant. In the present instance the skip and weight allow the use of the sheave hoist and tail rope, giving constant rope balance and making the hoist materially smaller and cheaper than a double-drum hoist.

Car and Tipple for Headings

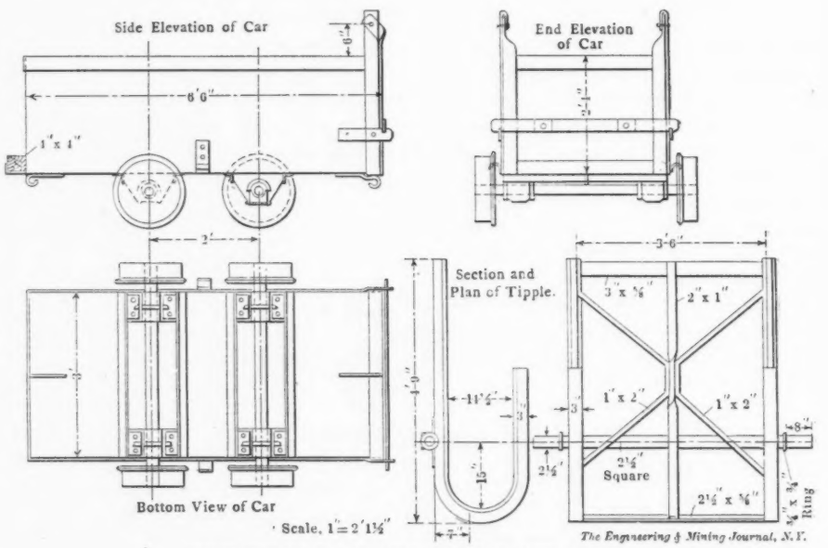
The Republic and Tennessee companies, in their newer slopes on Red mountain, Ala., hoist in 10-ton skips which, in headings are filled from 2-ton cars, dumped by tipples directly into the skips. The drawings accompanying this article show the details of the cars and tipples used in headings by the Tennessee Coal, Iron and Railroad Company. The cars are extremely strong and simple in construction. They are made of ⅜-in. steel, braced and reinforced as shown. By having the body of the car low and long, 2 ft. 4 in. x 6 ft. 6 in., several advantages are gained. In the first place the cars are made easy to load, a very important consideration. This construction, on account of the low center of gravity, also adds stability and reduces the liability of the car to overturn or jump the track; at the same time the long body does not make tipping excessively difficult. Two men who are always available when the skip is at any station, easily send the cars into the tipple with sufficent force to dump them.

Having the body of the cars so low, also allows the dump end of the car to be hung 6 in. above the side, thus giving an opening sufficiently wide to allow the ore an easy passage from the car. This is particularly necessary with these iron ores which break in quite large pieces which would be liable to block the dumping, were not sufficient clearance provided. Fig. 2 shows car in tipple in position of dumping the extra clearance gained by having the movable end hung above the sides of the car being brought out by the dotted lines.

The tipple is of the simplest construction, being constructed of pieces of 40-lb. track rail curved back, so as to grip the wheels of the car, and cross-braced with a 3x⅝-in. iron at the track end, and a 2½ x ⅝-in. iron on the curve, 7 in. above its base. A lateral brace, 2x1 in., connects these cross-braces and it is twisted at the center so as to be riveted to pieces of similar material, with the larger dimension placed vertically. A piece of 2½x2½-in. iron is used for the axle, 8 in. being allowed at either end for bearing. Usually there are two tipples at each station; one to receive the cars from the heading on either side of the slope. The slope is driven 9 ft. below the footwall of the ore so that ample fall is provided for dumping from the headings into the skip.



OPERATION OF TIPPLE IN HEADING



CONSTRUCTIONAL DETAILS OF CARS AND TIPPLES

A consular report notes that there is a good field in Siberia for the introduction of improved American gold-mining machinery. Germany is not a strong competitor in this line, and it is only recently that English manufacturers have begun to realize its possibilities. Mining machinery is one of the few articles admitted into the country free of duty.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

John P. Cosgro has been in Chicago on a short business trip.

Edwin J. Collins, of Duluth, Minn., is examining properties in Alaska for clients.

Norval J. Welsh is on an examination trip through eastern Sonora and western Chihuahua, Mexico.

H. C. Wilmot, of Salt Lake City, Utah, has been in New York for two weeks past, and has now gone West again.

Lucien Merritt, president of the Red Warrior Mining Company, has returned to Duluth, Minn., from a visit to Utah.

Marion L. Thomas left the City of Mexico, Nov. 30, for Ocotlan, Oaxaca, expecting to be absent about two months.

Edward V. d'Invilliers, of Philadelphia, has resigned his position as consulting engineer to the Rhode Island Coal Company.

Milton O. Knauss has been made superintendent of the Empire Steel and Iron Company's furnace at Macungie, Pennsylvania.

R. S. Burdette, of the Keystone Copper Smelting Company, Tapalpa, Jalisco, Mexico, has gone to New York on professional business.

Jacob H. Taylor, well known as a coal operator and coal-mine owner, celebrated his ninety-first birthday on Nov. 24, at his home in Baltimore.

Albert L. Tucker has been appointed manager of the Union copper mines, North Carolina. He had charge of the mines several years ago.

L. R. Wallace, of Morenci, Arizona, superintendent of the Detroit Copper Mining Company's smelter, is in New York on business for the company.

A. B. W. Hodges, of Grand Forks, B. C., has been visiting the Shattuck-Arizona copper mine at Bisbee, Arizona, for which he was recently appointed consulting engineer.

Arthur T. Marks, who left Butte, Mont., last March to take over the management of the Nile Valley Gold Mining Company, Egypt, anticipates returning to the United States next May.

Sidney J. Jennings has been placed in charge of exploration and examination of new properties for the United States Smelting, Refining and Mining Company, and will become a vice-president at the next meeting of the directors.

H. S. Stark has resigned the position of general manager of the Combination Fraction Mining Company, Goldfield, Nev., and Charles D. Wilkinson has been appointed in his place.

S. A. Beman, formerly of Cripple Creek, Colo., and later of Searchlight, Nev., is now superintendent of the Buena Fe Mining Company, in the Cerro del Torro, Jalisco, Mexico.

Dr. L. D. Ricketts, general manager of the Greene-Cananea interests at Cananea, Mexico, was in Morenci, Ariz., recently. Dr. Ricketts is also president of the Morenci Water Company.

Dr. C. Offerhaus, recently of New York, has accepted a position with the firm of Paul Schmidt & Desgraz, metallurgical constructors of Hanover, Germany. He has been a frequent contributor to the JOURNAL.

Harry L. Day was elected president of the Hummingbird Mining Company at the annual meeting of that company held in Burke, Idaho. Mr. Day is also manager of the Hercules mine which adjoins the Hummingbird ground.

Louis B. Godin, formerly superintendent for the Castellana Consolidated Mines, Ltd., in Tepic, Mexico, is now in the Guadalupe y Calvo district of Chihuahua to take charge of development work for the same English interests.

The Pocahontas Fuel Company announces the appointment of E. O. Parkinson as its Norfolk manager. Mr. Parkinson is now agent of the Norfolk & Western Railway Company, at Norfolk, Va., and will take up his duties before Jan. 1.

Carl Scholz, coal-mining engineer for the Rock Island system, accompanied by W. Weston, engineer in charge of the mining department of the Moffat road, has been making an extended examination of the Yampa coalfield of Routt county, Colorado.

Percival Roberts, of Philadelphia, and Samuel Mather, of Cleveland, O., have been chosen directors of the United States Steel Corporation in place of William Edenborn and Marvin Hughitt, resigned. Mr. Roberts was formerly president of the American Bridge Company. Mr. Mather is of the firm of Pickands, Mather & Co., iron-ore miners and shippers.

Charles Kirchhoff has resigned his position as editor of the *Iron Age*, of New York, after 32 years of service in that position. Mr. Kirchhoff has been identified with the *Iron Age* and has done much to give that paper its present high standing in the iron and steel trades. He was at one time assistant editor of the ENGINEERING AND MINING JOURNAL, and has done much work in connection with the Geological Survey, and in the general technical field.

Obituary

W. Y. Williams died at Lorain, O., Dec. 1, aged 66 years. He was for many years well known in the steel industry, and was an expert in the manufacture of bessemer steel, in which he had introduced many improvements. He was born in Wales, but came to this country when a young man. Over 40 years ago he became associated with the Cambria Steel Company, of Johnstown, later with Andrew Carnegie and then with the Edgar Thomson plant at Braddock, going to Lorain when the works there were built. He leaves a wife and five children.

Societies and Technical Schools

Mining Engineering Society of the Massachusetts Institute of Technology—At the October meeting George A. Packard delivered an address, relating various incidents of his recent mine examinations in the West. The November meeting was held jointly with the Harvard Mining Club; Prof. R. H. Richards spoke on "Development of Hindered Settling Apparatus," giving results of his own experimental work.

Southern Appalachian Coal Operators' Association—This association was organized at a meeting of coal operators from Tennessee and southeastern Kentucky, held in Knoxville, Tenn., Nov. 19. The officers chosen were: President, B. A. Morton, Knoxville, Tenn; first vice-president, H. M. Lafollette, Lafollette, Tenn.; second vice-president, M. J. Moss, Pineville, Ky.; third vice-president, James Woolridge, Knoxville, Tenn. The selection of the secretary was left to the executive committee which has called a meeting for Dec. 20, at which time it is hoped to get all of the operators from the Jellico field present who were unable to attend the first meeting.

Asociación Mineros de Zacualpan—This society was organized at Zacualpan, Mexico, some months ago and now has a membership representing 20 different mining companies and numerous individuals. The object of the association is the advancement of the science and practice of metallurgy and mining in the district and it will serve as the intermediary for the publication of authentic data regarding same. The association has commodious club rooms and in the reading room the principal mining and scientific periodicals and several daily papers will be kept on file. A room has been fitted up where a collection of minerals, ores and plans of the district will be kept, and a committee has been appointed to gather from the official and ecclesiastical repositories historical data which will be permanently filed in the archives of the association. The officers are as follows: Mauricio Morales, president; Emilio Gutierrez, first vice-president; Joseph Nibel, second vice-president; George Dillon, third vice-president; L. N. Shaw, secretary; Estolio Diaz, pro-secretary; Constantino Estrada, treasurer; H. L. Scaife, J. M. Platt, F. Rivas Guemas, Teodomiro Suarez, T. D. Hastings and Francisco Conejos, directors.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 1—The withdrawal from entry by the President of over 3,000,000 acres of petroleum-bearing lands in California, Wyoming, Utah and Oregon strikes California harder than it does the other States. These lands have been examined by the Geological Survey and determined to contain oil and gas. They have been heretofore taken up under the placer-mining laws, and it is now desired that special laws be passed by congress as to their entry and sale. It is supposed that the Government will ultimately use large quantities of oil on the ships of the navy and the oil lands are to be set aside for this purpose. Meantime several foreign countries have agents in California for the purpose of contracting for oil from the selling companies of the State. One very large contract has already been made with the agent of a foreign country at the rate of $1 per barrel.

The Producers Transportation Company has closed the gap in the hills through Palonia pass and the pipe line is now complete from the Coalinga field, in Fresno county, to tidewater. Oil is now the leading mineral product of California, the output last year having exceeded that of gold by several million dollars. The stoppage by the Government of further entry of oil lands is a fine thing for those who already own lands, but it will doubtless, to a great extent, stop further prospecting operations for a time at least.

The Anti-Débris Association at a recent meeting adopted resolutions about dredge mining which are of importance as showing the intentions of this association toward that industry. It was this association which, after years of work, virtually killed the hydraulic-mining industry in the central part of the State. The resolutions referred to, state that the association has become convinced that the operations of dredgers on the American, Yuba and Feather rivers, has done damage to the rivers and that especially on the Feather river, dredging operations have been carried on without system or organization, tending to greatly raise the flood plain of the river. The association wants the California Débris Commission to take charge of dredging, as well as hydraulic-mining operations, so as to improve the river. This request is made on the stated ground that while some of the dredging companies have shown a desire to operate without injury, others have been reckless.

The association announces its determination to continue to bring suits against certain companies doing supposed injury to rivers as it has against hydraulic-mining companies even though possessing permits from the California Débris Association. The association wants the commission to examine into the whole question so that new laws may be passed if necessary and the dredgers brought under similar restrictions to those applying to the hydraulic mines. The association plainly says that while thus asking the coöperation of the Débris commission, it reserves the privilege to act at all times as it sees fit to protect the rivers and adjacent lands irrespective of any action taken by the Débris commission. In other words, if the commission does what the Anti-Débris Association wants it to do, the association will remain quiescent, but if not it will do what it wants anyhow. So thus a challenge is thrown down both to the Débris commission and to the dredge operators as well.

Considerable interest is being manifested just at present in the magnesite deposits of California, though more particularly in the production of building material from this substance. There are many known deposits, though few have been developed owing to the fact that most of them are at distances from railroad transportation that prevent their profitable working. The deposits in Tulare county are the most productive. Most of the material is used in the manufacture of wood pulp for paper though some is used for making carbonic-acid gas. More or less building material is being made, such as floors, tiling, wainscoting, etc. As yet there being some doubt as to the proper kind of binder to make the material lasting. Several companies have been organized which have issued prospectuses intended to sell stock and in which many untruthful statements are made. Thus far no magnesite brick of any value has been made in California, though many attempts in that direction have been made. Even the flooring has not stood the tests satisfactorily in several instances. The wainscoting, however, has been much admired and is in demand. Some large buildings have used magnesite lately for several purposes. What seems to be most wanted here is a good technical man who understands this mineral substance thoroughly and can turn out a uniform product so that there will be no failures.

Butte

Dec. 7—The strike of railway switchmen throughout the Northwest has seriously affected the Butte mines. The Boston & Montana mines ship ore over the Great Northern railway to the smeltery at Great Falls. The other operating companies of the Amalgamated, including the Anaconda, Butte & Boston, Trenton and Washoe companies, ship ore over the Butte, Anaconda & Pacific railway to the Washoe smeltery, Anaconda. The North Butte and Coalition companies also ship ores to the Washoe smeltery. The W. A. Clark properties, which include the Original, West Stewart and Elm Orlu mines, ship ore to the Butte Reduction Works, in Butte, the ore being conveyed from the mines to the smelter over the street-railway line. The East Butte ore is being treated at the Pittsmont smeltery in the southern part of Butte. The majority of the small independent operators send the ore to the Washoe smeltery at Anaconda. While those companies which send ores to smelteries in Butte have an advantage over those which do not, yet all of the mines without exception were affected by the threatened failure of the coal supply. The coal situation to date is relieved by the fact that the Wyoming and Utah coal can still come over the Oregon Short Line and the Butte, Anaconda & Pacific roads, which are not affected by the strike. The Great Falls smeltery on the Great Northern, however, has closed and the mines at Butte shipping to it are closed. Of the Amalgamated properties, the Mountain View, West Colusa, East Colusa, Pennsylvania and Leonard are all closed. The railroads are endeavoring to resume without the striking switchmen, but as yet without any great effect on the traffic by freight.

It is probable that the Gilmore & Pittsburg railway, planned to run from Salmon City, Idaho, to Armstead, Mont., will be continued 24 miles to Dillon, Mont. The present route of the road taps several rich-mining districts in Montana and Idaho. It is thought possible that the road may eventually be extended to Whitehall, where it can make connections with the Northern Pacific's main line.

President Wolvin, of the Butte & Superior Company, has announced that, after considering a number of sites for the new zinc concentrator, the company has decided to build the mill on its own ground at the mine. Work on the foundations will be begun at once and it is

expected that the mill will be in operation March 1. It will have an initial capacity of 750 tons and will be built in units so that enlargements can be made. A new compressor is being installed which, with the one already on the property, will furnish air for 30 drills.

Denver

Dec. 4—Dredging in Summit county has, during the season just closing, reached the highest point in its career to date. The production as estimated by the daily press is, however, away and above that which will have actually been made. It has been stated that the output would total sums from $750,000 to $1,000,000. The production is rather less, being to date approximately as follows: Colorado dredges (two boats), $150,000; French gulch dredge, $150,000; Reliance dredge, $50,000; total, $350,000. This is nearer the mark, though it is difficult to arrive at any accurate estimate, as the companies are not giving out their actual returns.

The Reliance company, which is the pioneer of those working in the district, is dredging on French creek, about three miles from Breckenridge. This boat has been improved during the season by the installation of a new bucket line, consisting of 42 buckets of 5 cu.ft. capacity each, in close-connected link, together with installations of machinery of latest pattern, and the dredge is in better condition than at any time in its history.

The French gulch dredge is operating about one mile nearer Breckenridge. This dredge was not new when installed, but a year or so previously had operated unsuccessfully on ground near Golden. This result at Golden was laid rather to the low gold content than to the dredge. The machinery was moved to Breckenridge, and placed on a new hull, which was constructed under the direction of Frederick Estep, of California. Some changes were made in the general plan, and additions made to the machinery, including, among other things, new electric equipment. The operation of this dredge during this, its first season, has been entirely satisfactory, both as regards the running and the saving of the gold, which runs in some cases as much as 80c. per cu.yd., though the average has been much lower, probably about 25c. At this, it is an exceptionally rich deposit. The capacity of this boat is 3000 cu.yd. per diem. The bucket line is of the close-connected type, the capacity of the buckets being 5 cu.ft. each.

The Colorado Gold Dredging Company has operated two dredges continuously throughout the season, one on the Swan river, and one on the Blue river, five miles below Breckenridge. These boats are at present the largest in the district, having 9-cu.ft. open-connected buckets. The dredge which has been operating on the Blue river has been closed for repairs for about six weeks. A new bucket line of extra heavy construction will be installed this winter, and the old buckets will probably be added to those of the Swan river dredge, making it a close-connected type. The new buckets are of special design, and are said to be the strongest and heaviest 9-cu.ft. buckets ever built. The ground on the Swan river is said to have averaged 20c. per cu.yd. The ground at the confluence of the Swan and Blue rivers is said to have run from 40 to 60c. per cu.yd. for the last running of the Blue river dredge. Of course, this cannot be accepted as an average value. The boats have excavated at the rate of from 3500 to 4000 cu.yd. per working day.

The Reliance dredge will be run all winter, as the company has installed a device to prevent freezing of material on the stacker. The Colorado company will probably close very soon. The French gulch company will attempt to run until Jan. 1. It is problematical whether operations can be carried on efficaciously through the winter; it is evident that the two last named companies consider not.

The Reliance company has drilled in lower French gulch, and has found some very rich ground on its property. The drilling has shown that the old French gulch channel splits at the junction of Nigger gulch with French gulch, and from there to the Blue river, some three miles, there are two distinct and rich channels. Some added drilling has been made on the Blue river placers, known locally as the "Lambing property," and it is probable that a modern dredge will be installed next year. The Blue river placers have been proved to contain a large acreage of pay gravel between the mouth of French gulch and Swan river.

The dredges receive their power from the Central Colorado Power Company. All the companies own their own machine shops.

It has been frequently stated by the daily press that a large number of dredges will probably be in operation in Summit county within the next few years. This statement is misleading, as it is well known that there are but two or three tracts of dredgeable ground which remain unequipped.

There has been but little hydraulic mining in the Breckenridge district this year, but it is stated that considerable money will be expended for hydraulic equipment on properties in the vicinity the coming year. Hydraulic mining on a large scale has never been successful in this county.

The Cripple Creek drainage tunnel during November was advanced 298 ft. The full distance driven to Dec. 1 is 11,705 ft. The heading has been driven over 700 ft. into the granite of Beacon hill, and its extreme hardness has prevented more rapid progress. No moisture is observable in the breast of the tunnel, so tight is the rock, but it is expected that one of the numerous dikes traversing this section may soon be encountered and with it a flow of water. The minor water course tapped last month continuous to flow at the rate of about 100 gal. per min., but the water is carried off in the ditch and in no way interferes with work.

In anticipation of the results to be expected from the deep drainage tunnel, when the 3000 ft. of driving yet remaining is completed, properties on Beacon hill are making preparations to extend operations below the present water level. The El Paso is preparing to sink a shaft with three compartments from the present water level. The Gold Dollar Consolidated and the Henry Adney are also making similar plans.

Salt Lake City

Dec. 4—A suit for $3,870,000 has been filed by Col. E. A. Wall against the Utah Copper Company and D. C. Jackling, manager, and an injunction is asked to prevent the company from paying any more dividends until the suit is settled. It is charged that the Utah Copper has during the last four years stoped from the Amanda property, owned by Wall and adjoining the Utah Copper, 215,000 tons of ore valued at $6 per ton. This would bring the total damage to $1,290,000 but recent laws treble the damage against men or corporations which without right extract ore from the property of another and under this law the amount sued for is $3,870,000. Colonel Wall further alleges that the manager of the Utah Copper made a sworn statement before the State board of equalization Feb. 8, 1909, that 1,881,818 tons ore were extracted from the mine during 1908, at a net profit of $556,819 equivalent to 30c. per ton. And that during the last half of 1908 the Utah Copper paid two dividends amounting to $596,387, or $39,568 more than the net earnings of the company were sworn to be. He avers that the company statements show that only 6,000,000 tons of ore exist and that the 2,000,000 tons mined thus far this year have a lower copper content by 4 lb. per ton than previously and that at this rate the mine will be exhausted before the suit is settled. He asks that the court quiet title to the Amanda property forever in his favor, that the Utah Copper Company be made to account to him for the ore extracted, that his engineers and accountants be allowed to investigate the company to determine the exact amount due, and that meantime the company be restrained from paying any dividends.

The bear market on Tintics has resulted in the closing down of five properties, the East Tintic Gold King, Montana, Zuma, East Crown Point and Black Jack. The companies all have good showings which justify further development but there is no market for the treasury stock and under existing circumstances assessments are considered unwise so that the treasuries being de-

pleted there is no other course than to cease operations until more favorable times.

Cobalt

Dec. 2—The annual meeting of the Cobalt Central will be held in Augusta, Me., Dec. 17, and a stormy meeting is expected. It is understood that new interests will demand an investigation relating to loans made to the company, and which it is alleged have not been shown in the financial statement.

Norman R. Fisher, manager for the Temiskaming company, has returned from a visit to the Port Arthur region, bringing samples of silver ore. The property from which these were taken is one on which a small amount of work was done some years ago. The formation in which the silver was found is believed to be a continuation of the slates of Silver islet. The vein matter consists of calcite carrying leaf silver and argentite. Mr. Fisher gave it as his opinion that the country offered possibilities for the finding of silver. The Silver Islet mine, worked years ago, is near the north shore of Lake Superior, and had to be abandoned on account of water.

At the annual meeting of the Nova Scotia company, the shareholders will be asked to approve a by-law authorizing the directors to make application for an increase of the capital stock of the company by 500,000 shares, par value $1, this stock to be distributed pro rata among the shareholders at 50 cents.

The annual report of the Rochester mine informs the shareholders that over 400,000 shares of the new increase in capital has been taken up at 10c. per share. This will give sufficient funds to work the mine.

The Temagami Reserve Company has acquired control of the Gavin Hamilton property, Elk Lake district, and the Floyd mine, west Coleman. The former property is a mile outside of Elk lake, and much work has been done. Silver was found in narrow veins on the surface. The Otisse-Currie is controlled by the same group, and it is understood that this will also be included in the merger. It adjoins the Otisse in the Silver Lake district, and has some silver showing.

Toronto

Dec. 4—Revelations made in connection with the trial of an important mining suit at North Bay, indicate the need of an investigation by the Ontario department of mines. John Caley, of Latchford, sued F. A. McIntosh and Samuel McLaughlin, prospectors, claiming one-fifth interest in the property now known as the Bartlett mines, Gowganda, sold by McIntosh & McLaughlin for $250,000. The claim was based on an agreement by which Caley was to furnish the prospectors with "inside information" from the department of mines, which would enable the prospectors to find the O'Kelly location and stake claims around it. The exact situation of the O'Kelly location was being kept secret, but Caley, it is claimed, secured a map from someone in the department on which it was marked. Acting on this information McIntosh & McLaughlin secured the claims afterward sold to the Bartlett Syndicate. The defense set up was that the map was incorrect, and that Caley had also promised to obtain copies of the applications for the O'Kelly claims which he had failed to do. After evidence had been heard the case was settled out of court.

Mexico

Dec. 1—President Diaz has signed the new mining law. The few changes made by congress meet with general approval throughout the country, and the law as it now stands covers the complex questions arising in the mining industry in probably the simplest and most complete manner of any country in the world. F. F. Barker, a prominent attorney, is arranging a translation into English, with index and commentary notes that will shortly be published in book form.

For the three months ended Sept. 30, Mexico exported to the United States metals valued as follows: From Aguascalientes, copper 3,071,439 pesos; from Chihuahua, silver and lead bullion 703,823 pesos; from La Luz, Guanajuato, gold and silver concentrates, 34,517 pesos; from Parral, gold, silver and lead ores 328,925 pesos.

The Toluca Electric Light and Power Company, and the Sultepec Electric Light and Power Company, of which R. J. M. Donley is general manager, has completed arrangements to supply the town of Zacualpan, Mex., with electric light, and are bidding for power contracts with the various mining interests in the district.

La Blanca mine of Pachuca has ordered the following equipment for the new cyanide plant: Eight Pachuca tanks 15 ft. in diameter by 60 ft. high; six Dorr classifiers and three pulp thickeners, 30 ft. in diameter. The above order is placed through Grothe & Carter, Mexico City. The representatives of the Krupp company in Germany are supplying six Krupp seamless tube mills, 4x20 feet.

The Guanajuato Light and Power Company has increased its capital from $6,000,000 to $12,000,000. The additional capital is required for the extension of its transmission lines and the erection of new plants. This company furnishes power for the mining, manufacturing and agricultural enterprises of Guanajuato, La Luz and Irapuato. Norman Rowe is manager.

W. R. Ramsdell, of Guadalajara, has formed a company with American capital to acquire from Carlos Romero, of Etzatlan, the properties known as the Refugio, Las Animas and Tres Estrellas mines in the Hostopaquillo district, and the Amajac Reduction Works in Etzatlan, Jalisco. The capital is $2,500,000. Mr. Ramsdell is president, and C. A. Sidler, of Sunbury, Penn., is secretary and treasurer. The mines taken over by the new company are all old producers, and were owned and operated successfully by the Guadalajara house of Romero de Parra. Several millions of pesos were supposed to have been taken out of the Refugio mine by this family. It is the intention of the Ramsdell company to start new development work at once on the Refugio and Las Animas mines and reëquip the reduction works with Deister tables, tube mills and cyanide plant to handle the milling ore from these mines.

London

Dec. 1—The results of the working of the Mount Lyell Mining and Railway Company, Ltd., of Tasmania, for the half year ended Sept. 30, have been cabled to London from Melbourne. The net profit for the period is £139,850.

The most important development has been the proving in the North Mount Lyell mine of payable bornite ore at the 1100-ft. level. The company is doing a good business in the manufacture of agricultural fertilizers and in order to take advantage of this increasing trade new superphosphate works are to be erected at Fremantle.

The Dunderland Iron Ore Company, which has spent a large amount of money in trying to work low-grade iron ores in the north of Norway, is creating a further issue of £250,000 in 6 per cent. prior lien bonds with a view to saving the property for the present proprietors. If the whole amount is subscribed, it is estimated that after paying off all creditors, including the holders of existing prior lien debentures, there will be a sum of £75,500 for working capital. Of the amount offered, £200,000 has been underwritten, so that if the whole issue is not subscribed there will be £33,000 for maintenance and future expenses. Experiments have been recently made with a new wet magnetic separator, designed by Mr. Ullrich and the results are so encouraging that further trials, which so far have been conducted at the Krupp works in Germany, will be made on a full-sized machine at Dunderland. It is hoped that the fresh capital now being raised will enable the successful treatment of the one to be sufficiently demonstrated, so that further capital necessary for installing machinery on a working scale will be obtainable. The sum which is now being obtained for working capital is not large but the directors hope that it will lead to the enterprise being ultimately made into a profitable concern.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

The Iditarod strike is declared to be one of the most important in the history of Alaska. Other camps are being deserted and a stampede is in full swing.

The season of heavy gold receipts at the Seattle assay office ended Dec. 1 with a total of $11,733,489 for the six months beginning June 1. This is a falling off of $5,775,141 from the amount for the same period in 1908. The lack of water for sluicing has operated this year against a larger yield.

It is reported that the Copper River railroad has been completed to Tiekel river, 102 miles from Cordova, and that line is cleared for 98 miles further. This probably means that the line will be completed to the Bonanza mine in 1911, possibly by the end of 1910.

Hubbard-Elliot—The company will make large ore shipments via Cordova this winter. The first consignment, 400 tons, is at Tiekel, the end of the railroad. The ore will go to Tacoma.

Ebner—This mine at Juneau will resume development. H. F. Tripp is in charge.

Bear's Nest—A crew is at work sinking the old shaft in this property at Douglas.

Golden Gate—This mine, Chicagoff island, has shipped its first bar of bullion.

Arizona

COCHISE COUNTY

Copper Queen—The November ouput was 9,666,000 lb. of copper.

GILA COUNTY

Arizona Commercial—The November output is about 400,000 lb. of copper. Work on the 700-ft. level is interfered with by water and pumps will be installed to help the situation.

GRAHAM COUNTY

Detroit—This company at Morenci produced in November 1,894,000 lb. of copper.

New England & Clifton—The company's property will be sold at Portland, Me., Dec. 17, to satisfy claims. The bonded indebtedness is $145,000 and the floating debt $22,000. Nearly $250,000 has been raised for this property. Edward M. Bristol is managing director.

Shannon—The November output was 1,400,000 lb. of blister copper, slightly less than for this month, last year. The railroad will be completed in 60 days It is claimed that this road will effect a saving of 1c. a pound in the cost of production.

PIMA COUNTY

Imperial—The November output was 700,000 lb. The production for three or four months has been below normal, owing to the fact that in the Mammoth mines, part of the group owned by the Imperial company, the grade has fallen off as a result of running into a country much broken by an intrusive porphyry dike. An incline winze is being sunk from the 800-ft. to the 900-ft. level to get out of this low grade, which averages better than 3 per cent. The output of the Imperial mines for the six months ended July 1 has been approximately 1,000,000 lb. of copper per month. The company has three drills testing porphyry ground at Imperial with the expectation of developing an important tonnage of 2 per cent. ore, in which case a concentrator will be built and the smeltery enlarged.

Helvetia—Owing to advance in smelting rates shipments have been discontinued.

PINAL COUNTY

Arizona-Hercules—This property east of the Ray Consolidated is being drilled. Twelve holes finished are reported in ore and it is also reported that a hole east of the Ray fault at 400 ft. has penetrated the Ray schist which here is overlaid by 100 ft. of dacite. W. P. Dunham is president.

California

BUTTE COUNTY

Big Blue Lead—This mine at Bangor, recently started, has its drain tunnel in 1500 ft., and it will be run 500 ft. further to Poison Oak ravine, when an upraise will be made to reach the gravel. The gravel is cemented and will be milled.

Cape Horn—Levi Cohn has finished installing the machinery at this mine to handle the water and active operations have begun.

Spring Valley—This hydraulic mine near Orovolle will be worked again as a drift mine.

Empire—This gold dredge at Oroville, which capsized some time since, has been put into commission again after being remodeled.

ELDORADO COUNTY

Maginness, Wren & James are opening the Lone Star, Wild Rose and Old Abe mines, south of the Union mine near El Dorado.

Slug Gulch—At this gravel mine, formerly the Ensley, at Fairplay, they are making good clean-ups.

Orum—At this property, El Dorado, O. A. Ingraham, manager, specimen ore is being taken out of the shoot recently discovered.

Union—At this mine, El Dorado, the 1600-ft. shaft is the deepest vertical one in the county. Extensive development work is being carried on by Superintendent Effinger.

Oro Fino—It is expected that operations will shortly be resumed on this mine at Big Cañon.

KERN COUNTY

E. A. McCreadie, of San Francisco, has leased to Oscar G. Rodgers 17 mines in the Amalie district, including the Zada, Costly, Fawn and Lorene. An option to purchase has also been given.

Stockton Creek—Operations have come to a standstill at this mine owing to financial difficulties of the lessees.

NEVADA COUNTY

Champion—George E. Fitzgerald is the general manager of the new company which takes over these Nevada City mines Dec. 1. A new deep central shaft will be sunk.

Ridge—This mine at Columbia hill is being developed under the management of William H. Landrigan and a 500-ft. tunnel has been driven under the gravel channel.

Pittsburg Consolidated—Preparations are being made to sink below the 1000-ft. level.

Austin—This mine, near Nevada City, L. S. Austin, owner, is being worked by leasers who are crushing ore from the 300 level.

Mountaineer—Now that the first section of the vertical shaft on this Nevada City mine has been "holed" through, the extensive surface plant will be started up and ore will be taken out of the 400 level. The shaft will be continued to a depth of 2000 feet.

Aurora—It has been decided by the stockholders to reopen this Grass Valley mine.

Red Ledge—At this mine, Washington, the ditch has been dug, and in the spring the mill of the Eagle Bird will be moved to the property.

PLUMAS COUNTY

Langhorst—A strike has been made in this mine near Cromberg. The lode found in the tunnel is 8 ft. wide.

SHASTA COUNTY

Carnegie—At this group of mines,

seven miles from Kennett, Fred Bowler, manager, a 20-stamp mill will be erected.

Milkmaid—A crushing of 180 tons from this mine at French gulch netted $10,000 on the plates.

SIERRA COUNTY

George A. Sandborn, William Spencer and others, of Eclipse, have taken options on mining ground of P. A. Brangier on Mooreville ridge. The claims extend from the Kohl hydraulic diggings up the ridge to within two miles of the Bellevue property.

Omega—The mill of this gravel mine at Forest, W. G. Sharwood, manager, will now be run with three shifts instead of one, repairs made to the air shaft permitting more men to work underground.

Tightner—H. L. Johnson has mortared 300 lb. of the specimen rocks taken from this mine, and has realized $12,000 from it.

Centerville—This mine at Forest is being reopened by J. M. Fly and Harry Gray, of Nevada City. There is an 800-ft. tunnel on the property.

Dreadnaught and Rose—C. D. McGonigal, manager, says it is the intention to thoroughly develop these properties at Alleghany and Pike City, respectively.

TUOLUMNE COUNTY

Jumper—A contract for a 350-ft. shaft on the west vein has been let.

Yrma—Sinking has begun at this mine to develop the 8-ft. vein which has been discovered.

Colorado

TELLER COUNTY—CRIPPLE CREEK

The November production of the Cripple creek district of Colorado amounted to 62,715 tons of gold ore, of a gross value of $1,298,487. Total gold production for the entire 11 months of the present year was $14,503,212.

El Paso—It is rumored that J. Harry Avery, backed by the A. E. Carlton interests, will oppose the Allen L. Burris administration at the coming meeting in March. The company has declared an extra dividend of 1c. per share, making a payment of $2,000,000 in dividends.

American Eagles—Very rich ore has been discovered by sub-leasers in a block north of the main shaft at the second level. The property is under lease to the Colorado Mines Investment Company.

LAKE COUNTY—LEADVILLE

Boston—A tunnel is being driven from the foot of the hill to cut the large zinc and lead bodies that have been opened near the surface on this property in the Ten Mile district. Shipments are being sent out regularly from the upper workings and will continue until the tunnel reaches the ore zone.

Garbutt—Seventy-five tons daily are being shipped from this claim on Breece hill and as development work proceeds in the ore zone it becomes stronger.

Ibex—Fire in the Hopemore property has suspended work in No. 4 shaft of the Little Jonny, as the smoke is so dense that it is impossible for men to work. Determined efforts are being made to control the fire.

SAN JUAN DISTRICT

Tomboy—The November crushing was 3,300 tons, yielding bullion $39,000 and concentrates $30,500; making a total of $69,500. The expenses were $43,500, leaving profit, $43,500. Expenditure on permanent improvements, $1533.

Mineral Queen—This property, in Porcupine gulch, has been sold for $35,000 to H. M. Bateman, of Philadelphia, representing the Colorado Copper Company, which will develop the property.

Bonner—The Lutz company, of Pittsburg, will install machinery on this group and develop.

Old Hundred—The company is expecting to resume. Howell Hinds is president.

Golden Fleece—A strike of telluride ore is reported in this property near Lake City.

Idaho

COUER D'ALENE DISTRICT

Lucky Calumet—The mine, west of the Snowstorm, will install a 4000-ft. aërial tramway.

North Fork Smelting and Mining Company—The company has been organized by Maurice Blanchard, Carson Morrow, John Ponzetti, I. S. Daly and B. A. Glover, to operate the experimental smeltery at Enaville. If the tests prove a success, the plant will be enlarged and contracts taken for custom ore.

Caledonia—On the lower level a strike of native silver has been made.

Butte & Coeur d'Alene—An oreshoot 225 ft. long and extending from the 307- to the 507-ft. level has been uncovered.

Jack Waite—This company has recently been incorporated by Patrick Burke, Peter H. Schmitz and George Keibler, to operate the Jack Waite group.

North Bunker Hill—At 100 ft. a strike of lead-copper ore has been made.

Indiana

CLAY COUNTY

Secretary-treasurer Holden, of the block coalfield, states that the mild weather of the past month has put a decided check on what promised to be the busiest season for many years. During October the mines of this district were working every day and every miner. Now the demand for coal is light and the men are averaging little better than four days per week. The Indiana mines are seriously affected by the strike of the switchmen in the Northwest, that section of the country being the largest market. The coal going to the Northwest is usually in cars sent from that section. There is now a large amount of coal standing on sidetracks and in the big yards.

GIBSON COUNTY

A report that a fire had started recently in the Princeton mine from faulty and illegal shot drilling, brought Assistant State Mine Inspector Pearce to the mine, resulting in the arrest of three miners on charges of placing blasts improperly. Pleas of guilty were entered. Several other cases are pending.

Kansas

The manufacture of spelter has been resumed by the Chanute Zinc Company, north of Chanute. The plant has been shut down since July, when it was crippled by a fire.

Michigan

COPPER

The November mineral production is reported as follows: Baltic, 2,402,000; Champion, 2,580,000; Trimountain, 762,000; Franklin, 124,000; Victoria, 208,000; Mohawk, 1,170,000; Wolverine, 1,024,000 pounds.

Lake—This shaft is bottomed at the sixth level, while a plat is being cut to crosscut to the lode. In sinking in the footwall side from 90 to 100 ft. behind the present working lode, another copper lode was cut 20 ft. above the sixth level. The shaft entered this formation from the hanging-wall side and the portion of the lode so far exposed is well charged with copper. At the fifth level, the crosscut has reached the hanging-wall side after passing 135 ft. of the lode and showing a good grade of rock. A second mill test on 185 tons taken from the side of this crosscut gave a mineral return of 82 lb. per ton. Preparations are completed for daily shipment of 150 tons.

New Baltic Exploration—This company has encountered an amygdaloid copper-bearing formation. A drill core shows it to be about 70 ft. wide. This company is to be turned into the New Baltic Mining Company, capital at 100,000 shares, 50,000 of which will pay for lands of the Exploration company and the remaining 50,000 shares will be kept in the treasury for development.

Ojibway—Crosscutting is under way from the 1250-ft. level of both shafts to cut the lode. Drifting on the lode at 500 ft. continues yielding stamp rock. A drift from the 650-ft. level will be started. At the 800-ft. level the drift from No. 2 shaft is in the same grade of stamp rock, and the drift from the same level of No. 1 shaft, which passed out of the copper-bearing portion of the lode due to faulting is getting into a changed condition and, it is believed, approaching the lode.

Mass—Openings on the new Mass lode are showing indifferent results. Drifting is in progress from the 13th, 15th and 17th levels tributary to "A" shaft and also in the adit opening.

IRON

Mineral Mining Company—The company will erect steel shaft house and other buildings at the James mine, Iron River.

Cambria—The company has drills at work within the city limits of Norway.

Minnesota

Roy—This property on the Vermilion range promises to be a producer next season. The La Chance, adjoining, is drilling.

Montana

BUTTE DISTRICT

The estimated output of the Butte camp for November was 29,586,000 lb. of copper distributed as follows: Boston & Montana, 8,085,000; Anaconda, 7,752,000; North Butte, 3,486,000; Butte & Boston, 1,028,160; Washoe, 795,600; Butte Coalition, 4,410,000; Parrot, 443,120; Trenton, 786,640; W. A. Clark, 2,100,640; East Butte, 595,200; miscellaneous, 102,000; total, 29,586,300 pounds.

Butte & Balaklava—The shaft is down 1400 ft. Between 50 and 75 tons of ore are being shipped to the Washoe smeltery, Anaconda, daily from the 100- and 300-ft. levels.

Amalgamated—The shaft at the Gagnon mine is now down 400 ft. and is being sunk 100 ft. per month. The shaft is 4-compartment, two of which will be used for the skips, one as a sump shaft, and one for a cage to carry drills, water and timber.

Nevada

ESMERALDA COUNTY

Florence-Goldfield—A new discovery of ore has been made in the block of ground formerly worked by the Engineer's lease. In the mill, amalgamation has again been established on the plates below the stamps, and the use of carpets to catch the free gold abandoned.

Oro Fino—D. P. Marvel has made two shipments of ore from his property, 24 miles south of Goldfield.

Sandstorm—Plans are completed for the merger of the Sandstorm and Kendall companies into one corporation. The name of the new company will be the Sandstorm-Kendall Mining Company, with a capital of 2,000,000 shares of assessable stock. George Wingfield will likely be president.

Diamondfield-Black Butte Consolidated—Suit has been filed in the district court against this company for $20,000, the combined accounts of several creditors.

Goldfield-Nighthawk—H. B. Lind has secured a lease upon the property of this company, and will start sinking to strike the Red Top vein at depth.

Pittsburg-Silver Peak—Interests friendly to this company have purchased the property of the Silver Peak-Valcalda company at Blair, and its 12 patented claims will be prospected by the former company under the management of Edmund Juissen. The main Silver Peak tunnel will be extended into the Valcalda property, and will afford the outlet for the ore.

NYE COUNTY

The estimated value of the production from the mines of Tonopah for the week ended Nov. 27 is given at $124,050, the tonnage being made up as follows: Tonopah, 3250; Montana-Tonopah, 1052; MacNamara, 300; West End Consolidated, 160; Midway, 200; total, 4962 tons.

Mayflower-Bullfrog Consolidated—A new vein has been discovered in the main workings of the mine at Pioneer, from which ore running from $25 to $35 per ton is being mined.

Sierra Oro—Crosscutting at 212 ft. is being prosecuted, and 45 ft. more of driving will cut to the boundary of the Barnes lease where ore is known to exist.

Bullfrog-Pioneer—Shipments at the rate of $1000 per day are being maintained by this property. A new discovery has been made upon the 256-ft. level, supposed to be the continuation of the main oreshoot on its downward course.

Montgomery Mountain—Tom Kilker and associates have taken a lease upon a portion of this property at Bullfrog. Work has been started from the bottom of a 100-ft. shaft. A crosscut will be driven in the rhyolite-basalt contact, upon which contact the orebodies of the Shoshone occur.

Keane-Wonder—A new strike has been reported from this property at Bullfrog.

Toquima—The Fairview-Round Mountain Mines Company secured an injunction against the Toquima company from using the waters of Shoshone creek, and the sheriff shut off the water to the mill. An attachment was also served upon the Daisy company to cover costs. The Fairview company established its rights to 2465 in. of water in said creek, and the Toquima company was using it.

WHITE PINE COUNTY—ELY

Nevada Consolidated—Production for November was 5,764,000 lb. of copper. Work is being pushed on the fifth reverberatory at the Steptoe works and is expected to be ready for operation about Jan. 1. In the matter of exchange of stock, it is announced that about 96 per cent. of the Cumberland-Ely shares has been exchanged for Nevada Consolidated stock, and all of the holders of the $1,000,000 bonds of the Nevada Northern Railway Company have availed themselves of the conversion clause, as well as most of the Nevada Consolidated bondholders, there being only about $50,000 of the latter now outstanding.

New Mexico

SIERRA COUNTY

Ivanhoe—This property in the north end of the Black Range district is in operation again under the control of the El Paso Home Mining Company, Martin Fishback, engineer.

Elephant—This property in the Black Range district will resume and install machinery. D. S. Scoville, of Chicago, is in charge.

Oregon

BAKER COUNTY

Amazon—Progress is being made on this property, the drift tunnel being 70 ft. in good ore.

Quartz Basin—About $5000 has been spent in developing this group, owned by George Hemler.

Ben Harrison—This group of quartz claims has been sold by W. A. Gilliam to a New York syndicate.

Phoenix—This property is equipped with a 10-stamp mill, which the lessees, Wilson & Hoppe, have had in operation for several months with profitable results.

GRANT COUNTY

Cougar—This gold mine is being operated by the National Mining and Leasing Company. The mill has been remodeled and an all-slime process installed. Theodore L. Lammers, Granite, is manager.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The earnings for October were $3,444,846; expenses, $3,192,781; net earnings, $252,065. For the four months of the fiscal year, July 1 to Oct. 31, the statement shows: Earnings, $8,860,001; expenses, $8,835,022; net earnings, $24,979. As compared with the corresponding four months of 1908, this shows decreases of $1,244,038 in gross earnings and of $459,110 in net earnings.

South Dakota

Homestake—The strike situation is unchanged. The company holds firm for an "open shop" and has closed down practically all work and according to reports will remain closed for at least six months. In the meantime, electric installation for light and drills is being made throughout the mine. The company has been employing about two-thirds union men and the issue was drawn over a pending proposal for a "closed shop" and a 7-hour day. Many of the union laborers are leaving the camp.

Gold Dollar—The company at Crown hill has purchased the cyanide plant of the Eleventh Hour company and is moving it from Iron creek.

Holy Terror—A suit has been brought by Charles Morgan of New York to foreclose a $50,000 mortgage.

Utah

JUAB COUNTY—TINTIC DISTRICT

Golden Chain—The Golden Chain has absorbed the Ajax on a basis of share for share. The former has a 1,000,000-share capitalization and the latter 300,000. The deepest shaft on the combined property is the Ajax, 1100 ft. which is well equipped with machinery and will be used to accomplish speedy development of the Golden Chain. The Ajax is an old producer.

Iron Blossom—The No. 1 shaft has been closed down indefinitely. The reason given is that the smelters have advanced the treatment charges on this low-grade copper-silver ore to a prohibitive figure. The profits from the shipments from this shaft have been expended in prospecting from the shaft and this work will now be discontinued. The No. 3 or north shaft will continue work and shipments as usual.

Grand Central—The shaft has reached a depth of nearly 2200 ft. Drifting on this level will be started for the orebody which has been cut on the 2100, 2000 and 1900. The raise from the 1900 is also still in ore.

Raymond-Illinois—A diamond drill has been put at work on the 1500-ft. level. Sinking below the 1500 level would entail large expense for pumping, hence the exploration by the drill. If the drill develops ore to justify it a large pumping equipment will be installed and shaft sinking resumed.

Black Jack—The mine has been closed down following the policy of the other Knight properties. Negotiations are pending for the developing of the Black Jack through the deeper workings of an adjoining property.

Tintic Standard—The shaft is down 700 ft. The last 35 ft. was Cambrian quartzite, considered in that district as an unfailing guide to the orebodies. E. J. Raddatz, Salt Lake, is manager.

O. K.—This property in West Tintic, 15 miles from Tintic Junction, is resuming development.

Dragon Iron—Under a new contract, shipments of iron ore to the United States smeltery have been resumed.

Centennial-Eureka—The Holden tunnel is in 600 ft. This tunnel is to furnish an outlet for the ore as well as for the water, thus reducing the lift by the pumps 500 ft. A pumping plant to handle the heavy water flow is to be installed, and an electric-power plant and air compressors.

SALT LAKE COUNTY

Golden Lion—This company has been incorporated to develop the new strike in the Hiopert property, Big Cottonwood. Mr. Hiopert worked the property single handed for many years during which time he has driven the tunnel 1000 ft. The 12 in. of ore first found has widened to 6 ft. The ore is copper with several ounces of silver and some gold.

Columbus Consolidated—The first shipment of ore from the new strike averaged 4.35 per cent. copper; 21.4 per cent. lead; 41 oz. silver; and $1.70 in gold. This body is an entirely new one and runs parallel to the body, in which the previous work has been done.

Eagle Bird—The company's finances have been adjusted and development work will begin at once. Jacob Myers, Salt Lake, is manager.

Utah Apex—The 200-ton concentrator has been started satisfactorily. Developments are reported to have demonstrated the continuity of the orebody to 1700 feet.

Utah Metals—Work has been resumed on the merged properties of the Bingham Metals and the Bingham Central Standard companies. The 300-ft. tunnel will be advanced, and drifting on the fissures cut is expected to open other orebodies.

SUMMIT COUNTY—PARK CITY DISTRICT

Daly-West—The mine is not to cease operations as rumored. About 175 men are employed underground and 75 men on top and in the mill. Since the Ontario drain tunnel was reopened it has been extended to the Daly-West shaft at the 2100-ft. level. A winze is being sunk in ore from the 1700 level and a drift is being run on the 2100 level to cut this orebody.

Snake Creek—Preliminary details have been completed and bids for driving the three-mile tunnel, 10x7 ft. in the clear, will be accepted. G W. Lambourne is manager.

Daly-Judge—With the installation of the new compressor, now on the road from the factory, the output of the mine will be doubled. The zinc plant is treating 80 tons of ore per day and will soon have its capacity doubled also. The zinc product goes to the Grasselli Chemical Company.

Silver King Consolidated—A cage has been installed in the winze from the 1100-ft. level and the hoisting of ore has commenced. This ore comes from the 1500-ft. level from a fissure about 3 ft. wide. Entry to the shipping list by a mine located in a section of the district that has long been unfavorably considered opens up an interesting prospect for greater activity in Park City.

American Flag—After four years, work has been resumed on the 1100-ft. level. Sinking is to be resumed and the shaft continued to 1200-ft. The abandonment of work was caused by flooding due to the cave in the Ontario drain tunnel.

Virginia

Appalachian Mining and Smelting Company—This company has been organized to develop properties in Scott county near Fort Blackamore. A smelter is planned. Franklin Allison is engineer.

Washington

FERRY COUNTY

Tom Thumb—This mine has been unwatered to the 300-ft. level. Manager J. L. Harper states that 400 tons of ore is ready for shipment.

Kettle River—This company is installing a concentrating plant of 50 tons daily capacity. The ore is silver-lead, and the shaft down 135 ft. E. W. Scothern, Toppenish, is manager.

STEVENS COUNTY

Bornite—The company is driving a 5x7-ft. tunnel, and will continue the work all winter.

North Star—This property has 650 ft. of development completed, and expects to ship ore soon.

First Thought—A strike of gold ore has been made at this property. The mine is now shipping fifty tons of ore daily to Trail. The mine is owned by Pat Burns.

Oriole—The company has purchased the assets of the Morning and Mammoth company, and will transfer the machinery to the Oriole. Regular shipments will be made through the winter.

YAKIMA COUNTY

Gold Hill—Free milling gold ore has been found in sufficient quantity to justify development. New tunnels are being driven, and machinery will be purchased. Frank X. Nagler, North Yakima, is secretary.

Wyoming

At French creek, nine miles west of Holmes, James Dixon is developing a copper-gold property. At Devil's Gate, James Farrell is also working a copper-gold mine.

Rambler—This mine at Holmes, has shipped during the year more than 1500 tons of high-grade copper ore, part of it to Denver and the rest to Omaha, to which place all of the output is now going. Experiments to concentrate the platinum in the ore are being made by the metallurgist, Robert A. Marr, with reported success. The crude ore is said to contain from ½ to 4 oz. of the precious metals of the platinum group and the mine has already marketed several thousand dollars worth of these metals.

Duchess—This gold mine west of the Rambler is being operated by C. G. Sherman, of Denver.

Shawnee—The property, six miles northwest of Holmes, is working steadily. A road will be built to connect with the Rambler road at Albany, the nearest shipping point on the Laramie & Hahns Peak railroad.

Florence—This gold property, at Keystone, is under option to a company which is planning to install a cyanide mill. The Keystone mine, near the Florence, will also be revived if the deal is consumated.

Canada

British Columbia

Consolidated—The October production of the Trail smeltery was $412,865. The copper furnaces treated 36,100 tons and the lead furnaces 4933 tons. The production for four months is $1,881,447.

Highland United—This company controls 11 properties at Ainsworth, the principal of which is the Highland mine. This is a lead-silver property equipped with a mill in which $60,000 additional equipment is being installed. John S. Airheart is in charge.

British Columbia Copper—The company has placed orders for the necessary material for a fourth blast furnace which is to be 48x360 in., or 10 ft. longer than the present furnaces. It is also planned to extend No. 1 and No. 3 furnaces 10 ft. each. For the present it is not the intention to run the fourth furnace, this being planned as a reserve so that three furnaces may be in constant operation, for which the company has ample converter capacity. The ores of the New Dominion company will be smelted at Greenwood when its mines resume operation.

Ontario—Cobalt

Cobalt shipments for the week ended Nov. 26 were as follows: Nipissing, 259,328; La Rose, 262,298; Drummond, 220,000; Crown Reserve, 183,310; McKinley-Darragh, 43,903; City of Cobalt, 41,325; O'Brien, 63,993; Trethewey, 65,000; Beaver, 50,000; total, 1,189,157 lb. During November shipments from Cobalt were about the same as for the month previous, an aggregate of 4,959,651 pounds.

St. Lawrence-Cobalt—This company is putting in a plant on an island in Sasaganiga lake, and will commence operations.

Right-of-Way—A new 2-in. vein of high-grade ore has been encountered at the 75-ft. level.

Silver Cross—In sinking the shaft at 125 ft., diabase was found below the Keewatin, and in the former formation a good calcite vein carrying silver was discovered.

Victoria—The hoist house at this property was burned.

Rochester—This company is sinking a new shaft on the vein recently found.

Trethewey—A statement issued in connection with the sale of treasury stock estimates the ore reserves in sight at between 5,000,000 and 6,000,000 oz. The company has cash on hand, $200,325; ore sacked and in transit and due from smelters, $82,633; ore on dumps estimated to yield $450,000; ore developed underground, $2,500,000; total assets, $3,232,958.

Gifford Extension—The main shaft is down 200 ft. with a 10-ft. sump. A contract has been let for 300 ft. of crosscutting to reach the 27-in. vein cut by diamond drill and afterward tapped by crosscut at the 80-ft. level.

Ontario

Wetlauffer—This mine, at South Lorain, has shipped 58,000 lb. of silver ore.

O'Brien—On this mine, Miller lake, Gowganda, otherwise known as the Gates property, a strike has been made at the 100-ft. level 42 ft. in the crosscut. A 6-in. vein of calcite carrying silver has been encountered. Ore is being extracted. A 2-in. vein of high-grade ore has also been struck in the east drift at the same level.

Mexico

Chihuahua

Rio Plata—The October recovery was 57,147 oz. silver and the operating expenses $10,328, leaving net operating profit, $16,649, exclusive of tailings stored. The Pelton water wheels have been installed and the cyanide plant, now on one-third capacity, will soon be running full capacity.

Guerrero

La Dicha—This property of the Mitchell Mining Company, of New York, will be sold to cover the liabilities against it. A reorganization is being planned.

Pacific Copper Company—This company, owning a copper deposit in La Union district, 30 miles east of Zihuatanejo, is developing. W. S. Cockerill, of Mexico City, is in charge.

Dolores & Rio Grande—This English company is operating in the Guadalupe district. A. M. Bourne is manager. The ore is gold-silver bearing. An increased treatment plant will be installed.

Jalisco

Almoloya—The Almoloya copper mine, Ameca, has been sold by George E. McCormick to the Almoloya Mining Company, of Mexico City.

San Jose de las Agujas—A small reduction plant is being erected to treat the low-grade ore on the dump at Mascota. H. M. Sunde is the owner.

San Luis Potosi

Santa Eulalia—This mine, owned by J. T. Murphy, has been sold to the Empire Zinc Company, of Denver.

Sonora

Ramona Consolidated Mining Company—This company, with a capital of $2,500,000, has been organized to succeed the Ures Consolidated Company in control of the mine at Ures. The deal is being handled by Malcolm Green & Co., Boston.

Greene-Cananea—The November output was 1772 tons of copper containing 70,379 oz. silver and 460 oz. gold.

Dawson—Recent acquirement of funds from an issue of additional stock has enabled this concern to promise deliveries of bullion by Jan. 1.

Independencia—Work has been resumed on a moderate scale. This is an old property in the Sahuaripa district with gold and silver showings. W. E. Pomeroy is in charge.

Dos Cabezas—New machinery is being set up and additions made to the working force. The mill is in operation.

Africa

West Africa

Gold production of the Gold Coast and Ashanti in October was 15,957 oz., being 2168 oz. less than in September. For the 10 months ended Oct. 31 the total was 248,305 oz. bullion in 1908, and 200,520 oz. in 1909; a decrease of 47,780 oz. The bullion reported this year was equal to $3,944,331, or 190,824 oz. fine gold.

Rhodesia

The gold production in Rhodesia in October is reported at 52,904 oz. fine, making the total for the 10 months ended Oct. 31 this year 511,795 oz. In 1908 some of the reports were made in bullion, so that no comparison by quantities can be made. By values the total for the 10 months was $10,278,513 in 1908, and $10,483,209 in 1909; an increase of $204,696 this year.

Other products reported for the 10 months this year are 221,085 oz. silver; 73 tons copper; 819 tons lead; 13 tons tungsten ore; 23,940 tons chrome ore; 328 tons asbestos. The coal production, all from the Waakie mines, was 141,933 tons.

The number of men employed at the mines in September was 1687 whites and 35,691 negroes, a total of 37,378. The deaths of natives at the mines during the month were 168, or at the rate of 56.48 per 1000 per year.

Madagascar

Exports of gold from this French colony for three years have been 64,844 oz. in 1906; 72,100 oz. in 1907; and 99,995 oz. in 1908. The total production in 1908 was 101,242 oz., or $2,092,672. The production is improving, and is expected to reach 120,000 oz., or $2,480,000, this year. The most important workings at present are the placers on the Mortage & Grignon concession near Antisirane, in the district of Diego-Suarez. These placers yielded about 35 per cent. of the total production last year.

Asia

Indo-China

The mineral production of the French colony of Indo-China in 1908 included 312,061 metric tons of coal, an increase over 1907 of 17,030 tons; 18,055 tons of lignite, an increase of 2993 tons; 10,443 tons zinc ore, an increase of 4943 tons; and 164 tons of tungsten ore, a gain of 35 tons.

Korea

Oriental Consolidated—The 220 stamps crushed in September 28,381 tons. The gross receipts for the month were $112,871 and operating costs $62,677, and development costs $1727, leaving $48,466 net.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 8—The coal trade in the West is unchanged so far as demand is concerned. There is a steady call for steam coal, but domestic coal has been rather quiet owing to the mild weather which has followed the recent cold spell. In some quarters coal has been hurried forward under the apprehension that the switchmen's strike in the Northwest may extend to the middle western roads and tie up transportation. Otherwise there is no special change. The Lake trade is over for the season, but there is an apprehension that considerable coal will have to be forwarded to the Northwest by rail this winter, as the Lake deliveries did not come up to expectation.

In the East the bituminous coal trade is rather quiet but generally steady. Low prices continue to rule as supplies are abundant. Car shortage is still a feature in the trade.

The anthracite trade shows nothing new. At many collieries there is continued trouble on account of scarcity of water, and operators are looking anxiously for heavy rains.

In the bituminous fields both miners and operators seem to be preparing for a struggle over the mining rates and contracts for next year, although the present agreements will not expire until March 31 next.

Coal Traffic Notes

Anthracite shipments in November were 6,027,800 long tons; being 454,041 tons more than in October, and 198,309 tons more than in November, 1908. For the 11 months ended Nov. 30, the total shipments were, in long tons:

	1908.	1909.	Changes.
Reading	11,319,218	10,767,783	D. 551,435
Lehigh Valley	9,923,239	9,276,932	D. 646,307
N. J. Central	7,725,350	7,252,586	D. 472,764
Lackawanna	9,149,286	8,638,043	D. 511,243
Del. & Hudson	5,851,202	5,583,387	D. 267,815
Pennsylvania	5,495,326	5,372,352	D. 122,974
Erie	6,826,889	6,828,692	I. 1,803
N. Y., Ont. & West.	2,548,566	2,474,672	D. 73,894
Total	58,839,076	56,194,447	D. 2,644,629

The total decrease was 4.5 per cent. The Erie had a very small increase; all the other companies show losses, the larger ones being on the Lehigh Valley, the Philadelphia & Reading and the Delaware, Lackawanna & Western. The November shipments were larger than those for any preceding month this year, except March.

Coal tonnage of the Huntingdon & Broad Top railroad, 11 months to end of November: Broad Top, 420,546; Cumberland, 351,636; total, 772,182 tons, a decrease of 116,449 tons from last year. The Broad Top coal originates on the line.

New York

Anthracite

Dec. 8—The anthracite market is essentially a weather market and promises to remain so for some time to come. Aside from the regular steady trade there is little doing at present.

Schedule prices for large sizes are $4.75 per lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, quotations are nominally unchanged at $3.10@3.25 for pea; $2.25@2.50 for buckwheat; $1.75@2 for buckwheat No. 2 or rice; $1.35@1.50 for barley; all f.o.b. New York harbor.

Bituminous

The principal incident in the bituminous market this week is the close of Lake shipments and the cessation of the demand for coal for the West. No more is going to the Lake Erie ports and business has turned entirely upon the seaboard. Immediate result has been rather a surplus of coal offering and a weakening of prices from 5 to 10c. a ton, which does away with all the recent advance.

The far East is buying slowly and the demand from the shoalwater ports seems to be pretty well satisfied. All-rail trade is good. The Sound ports are doing better and are taking considerable coal.

Car shortage continue to be a serious feature in the market, and mines are having great difficulty in securing cars enough to keep them going. The situation is worst on the Baltimore & Ohio, but other roads are feeling it to a considerable extent. Transportation is slow and irregular on account, chiefly, of lack of motive power.

The talk of a general strike on the railroads has hustled up some buyers who do not want to be caught without supplies in case of trouble.

In the coastwise vessel trade there is not so large a supply of vessels and they are asking more on account of the risk of storms at this season of the year. Rates have advanced and $1 per ton is now asked for large vessels from Philadelphia to Boston, Salem and Portland; and 70c. for small boats from New York to points beyond Cape Cod.

Birmingham

Dec. 6—Coal production in Alabama is again up to the mark of 2½ years ago. The production during the latter part of September, in October, November and December—the bad weather and holiday period notwithstanding—will bring up the total output for 1909 to about what it was in 1908. The labor situation is being relieved a little by a steady influx of men. The demand for coal is strong and steady.

The coke demand increases right along and some purchases of coke from other parts of the South by Alabama consumers are noted.

Five men lost their lives in Alabama coal mines during the month of November.

Chicago

Dec. 6—The coal market in general continues prosperous; there is no sudden change, actual or impending, in the skies. Steam coals find larger demand every week; domestic coals are in good supply generally among retailers and the wholesale trade depends on weather conditions. With every cold wave—and the lowest thermometer reading has been registered at the beginning of the present week—there is a larger demand for coal by retailers and consumers. Under these conditions the coal market becomes solely a market of domestic retailers—the steam trade taking care of itself largely.

Illinois and Indiana coals continue to bring $2@3 for lump, $1.75@1.85 for run-of-mine and 95c.@$1.15 for run-of-mine. The higher-grade coals are most in demand, with the demand weakest for fine coals.

For coals from east of Indiana the market remains comparatively steady, the consumptive capacity of buyers of Hocking, Smokeless, West Virginia splint and of gas coals remaining steady and large. The little demurrage coal on tracks tells of shippers' negligence in ascertaining close market conditions.

Cleveland

Dec. 7—Lake trade is over for the season. The closing rush of the trade has cleared out stocks of lump and nut and left the market overloaded with slack. A renewal of warm weather has almost stopped domestic sales.

Prices are inclined to be easier. Middle district coal is $1.40 for 1¼-in.; $1.15 for ¾-in.; $1.05 for run-of-mine, and 60c. for slack; all at mine, with 70c. freight to Cleveland. No. 8 district brings $1.35 for 1¼-in.; $1.05 for ¾-in.; 95c. for run-of-mine and 60c. for slack; all at mine, with

90c. freight to Cleveland. Pittsburg is unchanged at $2.10 Cleveland for run-of-mine. Massillon domestic is steady at $2.95 Cleveland for lump and washed nut.

Indianapolis

Dec. 6—The mild weather of the past month and the railroad switchmen's strike in the Northwest have not been conducive to a large output from the Indiana mines. The demand for coal during the first week in December is the lightest experienced for years and in consequence men are working on an average of about four days a week.

Eighteen mines, mineral rights and timber tracts owned by the Indiana Southern Coal Company were deeded to the Alliance Coal Company Dec. 2. The property is in Vigo, Clay, Sullivan and Greene counties. The deed was executed by John K. Seifert, receiver for the Indiana Southern Company, which was one of the large interests of John R. Walsh. The price named is $1,500,000. The Alliance Mining Company is a holding company for the bondholders and it is said that plans are under way by which the mines will pass to operators.

Pittsburg

Dec. 7—The coal market is recovering from the irregularities caused by the close of the Lake season, and prices are steadier. Leading producers are holding out for $1.15 on mine-run and lump, $1.25 on ¾-in. and $1.40 on domestic coal, both for prompt and for contract. In some instances these prices may possibly be shaded, but leading producers are adhering to them absolutely. Slack is firmer also, at 65@75c. The higher price represents the minimum of some producers, but is not often paid.

Connellsville Coke—The chief transaction reported in the week was a contract for 12,000 tons of furnace coke monthly over 1910 at $2.80, ovens, to an eastern consumer. A sale of 2000 tons of furnace coke for shipment over the next fortnight was made at $2.80, and another sale of 1000 tons of prompt furnace coke at $2.90. The central western furnaces which have not yet closed for next year continue to hold off, looking for lower prices. Water shortage has been a factor and promised to close some operations, but the weather has just changed and there is a reasonable prospect that the water supply will improve in time. Both prompt and contract furnace coke may be quoted at $2.80@2.90, with prompt foundry at $3@3.25 and contract foundry at $3.25@3.50 at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Nov. 27 at 445,988 tons, a gain of 34,000 tons over the previous week. Shipments are reported at 5190 cars to Pittsburg, 8398 cars to points west of Pittsburg and 855 cars to points east of Connellsville, a total of 14,443 cars.

St. Louis

Dec. 6—Unless the cold wave for which the coal men have been so patiently waiting turns up shortly, the coal market of St. Louis will be in a state of complete demoralization. There is practically no domestic coal moving. Summer-time prices have prevailed throughout the fall at the yards and retailers have been unable to realize any margin. This is the first year in the history of the trade where there has been no advance in retail prices in the fall and winter. This is all the worse as the summer prices this year were lower than ever before in the history of the business. With the tonnage light and with no profit for either wholesaler or retailer the coal industry as a whole is in very bad shape this year.

Operators in the inner group have almost all without exception been losing money for the past 18 months and it is now getting to a point where a number of mines will be unable to keep floating much longer. The only hope seems to be that there may be some high prices during February and March owing to the anticipation of a strike in April. A wage scale has to be signed on April 1 by the operators in Illinois and it is certain that an agreement will not be reached without serious trouble. A number of points will have to be adjusted. During these dull times the operators in the inner group have realized that they were unable to pay the miners the present rate and compete with the low mining rate in southern Illinois. In fact, the southern Illinois mines, which have about 10c. per ton the advantage in the mining rate and a better coal, have taken half of the market away from the inner-group mines. The inner-group operators realize that unless they secure a more favorable differential, their existence is threatened.

Standard 6-in. lump is still held at $1.10 mine or $1.62 St. Louis, though the tonnage has fallen off decidedly; 2-in. lump is bringing 90c. mine or $1.42 St. Louis; 3-in. nut is quoted at 80c. at mine or $1.32 St. Louis and 1½-in. steam nut is bringing 50c. at mine or $1.02 St. Louis. Nut and pea are worth 30c. at mine or 82c. St. Louis; while 2-in. screenings are 10@20c. at mine or 62@72c. St. Louis.

Staunton, Mt. Olive or Springfield district 6-in. lump is still sold for $1.50 at mine, though during the past week this price has been shaded liberally; 2-in. lump is held firm at $1.20 per ton at mine or $1.72 St. Louis; 2-in. nut at 85c. mine or $1.37 St. Louis.

Carterville 6-in. lump brings $1.60@1.75 at mine or $2.27@2.42 per ton St. Louis; 3-in. to 2-in. nut is held at $1.35 at mine or $2.02 St. Louis; 1½-in. screenings are quoted at 35c. at mine or $1.02 St. Louis.

Franklin county 6-in. lump is fairly active at $1.80@2 at mine or $2.47@2.67 St. Louis; 3-in. to 2-in. nut is still in strong demand at $1.50 at mine or $2.17 St. Louis.

The condition of the anthracite market is bad. Eastern shippers persist in sending grate and egg that cannot be sold on the eastern market to St. Louis on consignment. With the market already choked and the weather exceedingly warm it makes these sizes impossible to move at anything like the circular. In fact, bigger concessions are being made on hard coal now in this market than at any time in recent years. Chestnut is still scarce and is in strong demand.

Foreign Coal Trade

Belgian Coal Trade—Imports and exports of fuel in Belgium, 10 months ended Oct. 31, metric tons:

	Imports.	Exports.	Excess.
Coal	4,794,710	4,255,919	Imp. 538,791
Coke	254,502	842,460	Exp. 587,958
Briquets	122,809	470,082	Exp. 347,273
Total	5,172,021	5,568,461	Exp. 396,440
Total, 1908	4,850,991	5,064,243	Exp. 213,252

The exports of coke are chiefly to France; of coal to France and Germany.

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to vessels in foreign trade, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.
Anthracite	2,334,281	2,359,661	I. 25,380
Bituminous	7,559,612	8,102,784	I. 543,172
Total exports	9,893,893	10,462,445	I. 568,552
Steamer coal	5,045,490	5,139,259	I. 93,769
Total coal	14,949,383	15,601,704	I. 652,321
Coke	498,907	730,720	I. 231,813

Canada took this year 8,246,920 tons of coal, or 78.8 per cent. of the total. The coke went chiefly to Mexico and Canada. Other large exports were 553,466 tons of coal to Cuba and 526,969 to Mexico.

United States Coal Imports—Imports of coal and coke into the United States, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.
Anthracite	15,029	3,178	D. 11,851
Bituminous	1,279,579	993,720	D. 285,859
Total coal	1,294,608	996,898	D. 297,710
Coke	95,650	143,150	I. 47,500

Canada furnished this year 827,469 tons of coal and nearly all the coke. Australia supplied 145,149 tons of coal; Japan, 9274 tons. Imports are chiefly on the Pacific Coast and in the northwestern border States, though some Nova Scotia coal comes to New England.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Nov. 27: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Dec. 8—The iron and steel markets continue rather quiet and most people believe that the usual end-of-the-year dullness has set in a little earlier than usual. This may easily be the case in view of the very heavy business of October and November. A further feature of the market is the pronounced disposition of sellers to discourage buying too far ahead by jobbers and speculative interests.

There has been comparatively little buying movement in pig iron, most new business reported being in small lots either to fill gaps or to supply foundrymen for orders in excess of expectations. Moreover there is a general disposition to believe that prices have advanced too much, and buyers will undoubtedly try to get concessions on third-quarter business. This can be done, they think, by holding back at the present time.

In finished material new business is rather quiet, although specifications on contracts continue heavy, and the mills are full of business. A disposition on the part of some jobbers to order heavily in a rather speculative way has been checked by the large sellers. About the only exception to the general tendency is in structural steel, in which several large contracts have come forward lately, while others are understood to be pending.

No concerted action has been taken yet about prices of Lake Superior iron ore for next season. It is understood, however, that one or two of the large selling interests have taken some contracts for 1910 delivery at an advance of 40c. a ton on this season's quotations. The expectation is that such an advance will be general.

Canadian Iron Bounties—A statement of the bounties on iron and steel paid by the Dominion government in the fiscal year ended March 31, 1909, is as follows: Dominion Iron and Steel, $1,067,529; Algoma Steel, $304,789; Hamilton Steel and Iron, $252,312; Nova Scotia Steel, $130,-354; Lake Superior Corporation, $45,891; Canada Iron Furnace Company, $39,968; Canada Iron Corporation, $9726; Ontario Iron, $6888; Canada Iron Company, $3743; John McDougall & Co., $3394; total, $1,-864,614, to 10 companies.

Baltimore

Dec. 7—Exports for the week included 772,630 lb. scrap tin to Rotterdam. Imports included 2000 tons spiegeleisen and 1575 tons manganese ore from Great Britain; 14,950 tons iron ore from Cuba.

Birmingham

Dec. 6—Manufacturers of pig iron in the Southern territory, save for a little of the product for delivery during December, are holding their product at $15 per ton for No. 2 foundry. Some resale iron is selling, though not in a very great amount, under that price, from 25 to 50c. lower. The rumor that iron is still selling under $14.50 per ton is not to be verified. The make in the South continues at high-water mark. The production in November in Alabama is estimated at 175,500 tons of coke iron and 3000 tons of charcoal iron. This is about 5000 tons over the October make.

Charcoal iron holds firmly at $22 per ton.

Foundries and machine shops in the Southern territory are melting a good tonnage. The railroads are giving satisfaction in moving out the product promptly.

Chicago

Dec. 6—Weakness in general marks the pig-iron market, and in the lines of finished goods it is whispered that the furnaces never before, at the hight of a supposedly busy season, were able to deliver goods so promptly. The inference is obvious; the consumer has caught up to present and prospective requirements, and will not buy largely. The pig-iron world seems to consider this not an unmixed blessing. In the last week, sales of pig iron have been chiefly in small lots of Northern No. 2 at $18.50@19 and Southern No. 2 at $14@14.50 Birmingham—$18.35@18.85 Chicago.

General conditions in the iron and steel market continue good, the sales of railroad supplies, structural supplies and other fundamental shapes continuing large. Pig iron is now sold mostly for second and third quarters, with small increase in even inquiries for third and fourth quarter. The market indeed seems to have turned to deliveries within the next six months as a fixed requirement in the pig-iron industry. Coke continues to bring $5.50 for the best Connellsville, but with sales very light.

Cleveland

Dec. 7—Lake insurance expires tomorrow, and navigation will be officially closed. A few scattering cargoes may come down, but most of the big boats are being laid up as they come in.

Pig Iron—Little new business has been done, but iron on contracts is being taken in large quantities, and foundries are all busy. Prices are well held in the absence of sales, and there is no disposition to make concessions. Quotations are $17.75@18 for basic; $18.25@18.50 for No. 2 foundry; $17.25@17.75 for gray forge; $19.50@20 for Lake Superior charcoal.

Finished Material—Bar iron, steel bars and spikes have supplied most of the new business. There is complaint of slow deliveries on contracts. Jobbers report a large trade in bars and structural steel.

Philadelphia

Dec. 8—The pig-iron market is quoted down still more and only a small amount of business has been done. The negotiations for further deliveries of basic pig begun a week or two ago have not resulted in sales. The assurances are given that present quotations will be the price when the arrangements as to shipments are concluded. Foundry irons have quieted down though all consumers have not yet covered for the first quarter. Forge iron also is quiet. Northern No. 2X is quoted at $19@19.50; gray forge is close to $18, with Southern makes offered at about the same figure.

Steel Billets—The excitement over early deliveries of steel billets has about subsided. Nearly every consumer has stock in hand or contracts covering requirements from 30 to 60 days.

Bars—The bar mills book orders for new work faster than old orders are executed. Large orders are exceptional.

Sheets—A large amount of business has been done consisting of assorted orders, chiefly for distributors for this territory. Manufacturers have quoted figures on early spring deliveries but have booked no such business as yet.

Pipes and Tubes—Work in all branches using pipes and tubes is abundant and business is going to the mills for late deliveries.

Plates—Very little business has been done this week but a large amount is still hanging fire, some of it for delivery as late as second quarter. Prices are firm and another advance is said to be contemplated.

Structural Material—All interest is centered in the business in sight for the coming winter and spring. A large amount of work is in sight for railroads and buildings.

Scrap—Dealers are endeavoring to accumulate scrap and are offering better prices for railroad scrap which is quite abundant, but is held at high prices. Heavy melting steel is scarce and the dealers are under contract to deliver a good deal which they have not yet secured.

Pittsburg

Dec. 7—New buying in pig iron and finished steel continues extremely light, but specifications are still coming in at a good rate in most lines. Production is kept up to the highest possible notch. There is no likelihood of any increase in market activity this month.

Finished-steel prices show practically no change, steel bars being 1.45@1.50c. and plates and shapes 1.55@1.60c., the lower prices being done only in exceptional cases. The current demand for sheets and tinplates continues good.

Pig Iron—The market has been almost lifeless, but prices have not receded. Inquiry is negligible, but shipments are well taken. The market f.o.b. Valley furnace—90c. higher delivered Pittsburg—stands as follows: Bessemer, $19; basic and No. 2 foundry, $17@17.25; forge, $16@16.25; malleable, $17.25. The higher prices, where named, are for delivery in first quarter or first half of next year. The bessemer average for November was $19, Valley, 69,300 tons figuring in the compilation. The total purchases of the five independent steel works—Cambria, Lackawanna, Jones & Laughlin, Republic and Youngstown Sheet and Tube—on this movement, which began late in May last, amount to a little over 400,000 tons, while total market transactions in the period were well above 500,000 tons. The basic average for November is reported at $17.49, Valley, or $18.39, Pittsburg, but owing to the incidence of some sales when the market was temporarily excited the average thus reported is above the average of daily quotations, which would run below $17.25 for the month.

Steel—Fancy prices are being asked for billets when they are offered at all, as high as $29, Pittsburg, in some cases, while the quotation of $27.50 named a week ago is purely nominal. The market may be quoted roundly at $28@28.50, with forging billets and small billets commanding large premiums. Some sales of sheet-bars for first quarter have been made at $29.50, maker's mill.

Ferromanganese—The market is quiet but strong, at $45@46 for prompt and $45.50@46 for first quarter, f.o.b. Baltimore, freight to Pittsburg being $1.95 per ton.

Sheets—There was some rioting at Bridgeport, O., last week, caused by the American Sheet and Tin Plate Company's attempt to resume operations at its Aetna-Standard plant, containing 23 mills. The attempt has been temporarily abandoned. This was the only sheet plant involved in last summer's walkout at which not even a partial resumption had been made. The company has 186 sheet, jobbing and light-plate mills, or 163 outside of the Aetna-Standard plant, and practically all of these were running last week, although some were not obtaining full output. The independent sheet mills are running full with scarcely an exception. There is good buying, and mills have already sold about three months' production into next year. Prices are firm at 1.75@1.80c. for blue annealed, 10 gage; 2.40c. for black and 3.50c. for galvanized sheets, 28 gage; $1.70 per square for painted and $3 for galvanized corrugated roofing.

St. Louis

Nov. 6—As we approach the end of the season the demand for pig iron slows. The market in general is quiet at the same prices that have been prevailing. A little business is being closed, here and there, for shipment for the second quarter at $15@15.25 f.o.b. Birmingham, or $18.75 @19 St. Louis. Furnaces all have nearly their entire tonnage sold up and consequently the market, though quiet, is in a healthy state. The demand for iron from local furnaces is strong and they are entirely sold up.

Iron Ore—The demand for 50 per cent. Missouri iron ore continues to be very strong at $3.75 per gross ton, f.o.b. St. Louis.

The new ore washer at Greenville, which was recently put in operation, is turning out ore regularly and expects to increase its tonnage rapidly.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the 10 months ended Oct. 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor at $127,985,824 in 1908, and $128,170,458 in 1909; an increase of $184,634, or 0.14 per cent. The leading items of exports were, in long tons:

	1908.	1909.	Changes.
Pig Iron	37,089	48,575	I. 11,486
Billets, ingots & blooms	94,852	98,522	I. 3,670
Bars	42,625	71,128	I. 28,503
Rails	175,462	211,820	I. 36,358
Sheets and plates	85,058	141,363	I. 56,305
Structural steel	100,527	74,473	D. 26,054
Wire	111,139	123,849	I. 12,710
Nails and spikes	31,717	38,727	I. 7,010
Pipe and fittings	96,188	132,347	I. 36,159

Exports of mining machinery were valued at $3,227,793 in 1908, and $3,671,206 in 1909; an increase of $443,413 this year.

Iron and Steel Imports—Imports of iron and steel and of machinery into the United States, 10 months ended Oct. 31, were valued at $16,389,753 in 1908, and $23,516,177 in 1909; an increase of $7,126,424, or 43.5 per cent. The leading items of the imports were, in long tons:

	1908.	1909.	Changes.
Pig iron	73,383	111,624	I. 38,241
Scrap	3,748	25,522	I. 21,774
Ingots, blooms, etc.	7,762	13,372	I. 5,610
Bars	15,800	13,968	D. 1,832
Wire-rods	9,503	9,514	I. 11
Tin plates	51,368	49,351	D. 2,017
Sheets and plates	1,976	3,058	I. 1,082

The increase in scrap was mainly in heavy steel scrap for use in the basic open-hearth furnace. Structural steel, usually a small quantity, increased from 2299 tons in 1908 to 5327 this year.

Iron Ore Movement—Imports and exports of iron ore in the United States, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.
Imports	560,824	1,298,836	I. 738,012
Exports	262,113	433,623	I. 171,510

Of the imports this year 725,185 tons were from Cuba and 168,875 from British North America. The balance was chiefly from Spain and Norway. The exports were chiefly to Canada.

Manganese Ore Imports—Imports of manganese ore into the United States for the 10 months were 154,698 tons in 1908, and 178,112 tons in 1909; an increase of 23,414 tons.

Metal Markets

New York, Dec. 8—The metal markets generally show little change from last week. Consumption evidently continues good, and price changes have been small.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Dec. 4: Gold, $3,781,900, chiefly to Brazil and Argentina; silver, $1,034,352, chiefly to London and Paris. Imports: Gold, $422,404, from France and the West Indies; silver, $57,598, from Mexico and South America.

The December price of pure silver in Mexico, which will serve as the basis for calculating the stamp tax for the month, as fixed by the Secretary of the Treasury in conformity with the law, is 33.17 pesos per kg.—equal to 51.38c. per troy ounce. Prices for previous months this year have been: January, 31.82 pesos per kg.; February, 33.11; March, 33.72; April, 33.04; May, 33.16; June, 34.16; July, 34.39; August, 33.74; September, 33.30; October, 33.63; November, 33.17 pesos.

Gold—Supplies of gold on the open market in London were abundant and prices continued at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for coin. The Bank of England took most of the gold arriving. In New York about $1,000,000 in gold were taken for shipment to South America, mainly on London account.

Platinum—Business continues on very good scale and prices are well held at $29.50 per oz. for refined platinum. Iridium is scarce and there has been a sharp advance in prices, so that dealers are now asking $35.50 per oz. for hard metal, which is an alloy of platinum and iridium.

Our special correspondent writes from St. Petersburg, under date of Nov. 11, that prices continue to advance. Demand is good and the market is strong. Production is increasing owing to the high prices. At Ekaterinburg small quantities of crude metal, 83 per cent. platinum, can be obtained at 6 rubles per zolotnik—equal to $22.56 per oz. In St. Petersburg the same grade of metal is quoted by the large dealers at 23,000@23,500 rubles per pood—equal to $22.79 per oz., average.

Silver—The silver market has remained steady during the past week, and closes firm in London at 23¾d., on buying supposed to be for the Continent of Europe.

SILVER AND STERLING EXCHANGE

Dec.	2	3	4	6	7	8
New York....	51¼	51⅜	51⅝	51½	51½	51⅝
London.....	23 9/16	23⅜	23¾	23 11/16	23 11/16	23¾
Sterling Ex..	4.8780	4.8775	4.8775	4.8780	4.8785	4.8780

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 25, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,359,623	£5,858,500	D. £2,501,123
China.....	571,400	1,829,300	I. 1,257,900
Straits.....	164,885	114,614	D. 50,271
Total.....	£ 9,095,908	£7,802,414	D. £1,293,494

Indian exchange in London was 16.125d. per rupee.

Copper, Tin, Lead and Zinc

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
2	13⅜ @13½	13 @13¼	58¾	31⅝	4.40	4.25 @4.27½	6.17½ @6.20
3	13⅜ @13½	13 @13¼	58⅞	31⅝	4.40	4.25 @4.27½	6.17½ @6.20
4	13⅜ @13½	13 @13¼	....	31¾	4.40	4.25 @4.27½	6.15 @6.20
6	13⅜ @13½	13 @13¼	59¼	31⅞	4.40	4.25 @4.27½	6.15 @6.17½
7	13⅜ @13½	13⅛ @13¼	59	31⅞	4.40	4.25 @4.27½	6.15 @6.17½
8	13⅜ @13½	13⅛ @13⅜	59⅛	32¼	4.40	4.25 @4.27½	6.12½ @6.17½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week ending with Dec. 8, business has been on a small scale, relatively speaking, although some millions of pounds have been sold. However, sales have to average over 4,000,000 lb. per day to take care of the current output. In Lake there has been scarcely anything done and the quotations are quite nominal. Electrolytic has been sold both for domestic and foreign delivery, chiefly the latter. For that reason prices have been affected to a considerable extent by the fluctuations of standard copper in London. As late as Dec. 6 some fairly large sales were made upon low terms, but since then there has been a better feeling and some improvement in prices realized upon business actually done. Several of the producers have continued to hold aloof from the market, nominally asking prices much above the present basis of business. The close is steady at 13⅜@13½c. for Lake copper, and 13⅛@13⅜c. for electrolytic cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅞@13⅛c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is active.

It appeared that toward the end of last week in London the realizing movement, coincident with the Standard Oil decision, had about exhausted itself and prices began to harden. The undertone, however, remains undecided and the close is cabled at £59 2s. 6d. for spot and £60 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £73 10s.@£74 10s. per ton.

Exports of copper from New York and Philadelphia for the week were 5680 long tons. Our special correspondent gives exports from Baltimore at 2468 tons copper.

Tin—The bull party had all its own way in the London market. Transactions were heavy at rapidly advancing prices, and the close is cabled as steady at £146 for spot and £147 15s. for three months. The strength of the London market did not exert much influence on consumers in this country. There was some business done between dealers, but consumers followed a hand-to-mouth policy buying spot material only. The latter is well controlled, selling at a premium over the import price. The close in the domestic market is about 32¼ cents.

Visible stocks of tin on Dec. 1 are reported as below, in long tons:

	In Store.	Afloat.	Total
London	7,915	4,499	12,414
Holland.....	2,497	187	2,684
U. S., exc. Pacific ports	2,337	2,590	4,927
Total...	12,749	7,276	20,025

The total shows an increase of 1301 tons over the stocks on Nov. 1, and of 72 tons over those on Dec. 1 of last year.

Lead—The market is steady, with a fair business doing at 4.25@4.27½c. St. Louis, and 4.40c. New York, for ordinary brands. The price of the American Smelting and Refining Company for desilverized continues to be 4.40c., New York. Special brands of lead have fetched a rather large premium in the St. Louis market.

The London market is again lower, at £12 17s. 6d. for Spanish lead, and £13 for English.

Spelter—The demand continues very light, and there has been more pressure on the part of the smelters to place their current output. Prices have yielded from day to day and the close is weak at 6.27½@6.32½c. New York, and 6.12½@6.17½c. St. Louis.

New York quotations for spelter, Dec. 2 and 3, were: 6.32½@6.35c.; Dec. 4, 6.30@6.35c.; Dec. 6 and 7, 6.30@6.32½c.; Dec. 8, 6.27½@6.32½ cents.

The London market is unchanged at £23 for good ordinaries, and £23 5s. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market continues dull, and is not expected to improve this month. Cookson's is quoted at 8⅜@8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—Business is fair and the market continues strong. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, 10 months ended Oct. 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	257,802	112,168	Exp. 145,634
Copper, 1908....	258,969	75,065	Exp. 183,904
Tin, long tons....	369	36,952	Imp. 36,583
Tin, 1908.....	192	29,294	Imp. 29,102
Lead, short tons.	76,702	92,115	Imp. 15,413
Lead, 1908.....	60,848	91,279	Imp. 30,431
Spelter, sh. tons.	2,331	8,039	Imp. 5,708
Spelter, 1908....	2,410	824	Exp. 1,586
Nickel, lb.	9,597,003	16,974,125	Imp. 7,377,122
Nickel, 1908....	8,580,840	15,115,275	Imp. 6,534,435
Antimony, lb.....	6,648	6,272,943	Imp. 6,266,295
Antimony, 1908.	.....	6,901,591	Imp. 6,901,591
Platinum, oz.....	.....	98,161	Imp. 98,161
Platinum, 1908.	.....	31,802	Imp. 31,802
Quicksilver, lb .	490,193	.....	Exp. 490,193
Quicksilver, '08	214,015	.....	Exp. 214,015
Aluminum, value	$464,733	.....	Exp. $464,733
Aluminum, 1908	291,364	.....	Exp. 291,364
Ores, etc.:			
Zinc oxide, lb.	23,610,250	.....	Exp.23,610,250
Zinc oxide, '08..	20,708,007	.....	Exp.20,708,007
Zinc dross, lb....	13,424,440	.....	Exp.13,424,440
Zinc dross, '08..	14,580,283	.....	Exp.14,580,283
Zinc ores, lg.tons	11,121	88,219	Imp. 77,098
Zinc ores, 1908.	23,311	41,052	Imp. 17,741
Antim'y ores, lb.	504	3,386,708	Imp. 3,386,204
Ant. ores, 1908.	2,520	2,400,584	Imp. 2,398,064
Chrome ore, tons	.....	32,613	Imp. 32,613
Chrome ore, '08	.....	.....	.....

Estimated zinc contents of ore imported August to October, 6,808,834 lb. Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year.

Spanish Metal Exports

Exports of metals and minerals from Spain, nine months ended Sept. 30; reported by *Revisa Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	24,866	44,416	I. 19,550
Copper	10,245	12,569	I. 2,324
Copper precipitate	15,715	13,678	D. 2,037
Lead	140,244	141,461	I. 1,217
Zinc	815	907	I. 92
Quicksilver	1,800	1,488	I. 312
Minerals.			
Iron ore	5,758,935	5,801,699	I. 42,764
Manganese ore	16,593	10,782	I. 5,811
Copper ore	893,308	847,702	D. 45,606
Lead ore	2,493	2,741	I. 248
Zinc ore	87,978	97,158	I. 9,180
Pyrites	1,088,707	1,020,775	D. 47,932
Salt	464,233	441,232	D. 23,001

Imports of phosphate rock, 104,509 tons in 1908, and 113,123 in 1909; increase, 8614 tons.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 4—The highest price paid for zinc was $55, the base of zinc-sulphide ore ranging from $50@$52.50 per ton of 60 per cent. zinc. The base price of zinc silicate ranged from $28@30 per ton of 40 per cent. zinc. The average price, all grades, was $49.26 per ton. Lead was in better demand, but there was no change in prices, $53 per ton being paid for grades running from 78 to 82 per cent. metal. The average price, all grades, was $52.86 per ton.

There was a material relief in the car situation, and the smelters shipped some of the zinc ore that has been purchased but had not been removed from the bins of the producers from lack of cars. Buying the past week was steady and prices were firm, the production being purchased closely.

Platteville, Wis., Dec. 4—The highest price paid this week for zinc ore was $51 per ton; the base price, 60 per cent. zinc, was $50 per ton. The base price paid for lead ore was $53@54 per ton.

SHIPMENTS, WEEK ENDED DEC. 4.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	585,220	.....	256,900
Highland	483,700	.....	.....
Mineral Point	450,000	.....	.....
Benton	330,450	.....	.....
Days Siding	166,000	.....	.....
Cuba City	160,410	86,225	.....
Galena	80,000	.....	.....
Rewey	67,000	.....	.....
Harker	60,880	50,000	.....
Total	2,383,660	136,225	256,900
Year to Dec. 4	128,316,555	8,768,430	14,436,115

In addition to the above there was shipped to the separating plants, at Platteville, Galena and Mineral Point, 1,328,890 lb. zinc concentrates.

SHIPMENTS, WEEK ENDED DEC. 4.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,944,420	962,280	$151,580
Joplin	2,502,310	159,260	69,905
Miami	1,015,240	269,180	29,468
Duenweg	1,142,530	32,520	28,635
Prosperity	740,650	102,560	21,603
Galena	796,170	38,580	20,926
Badger	770,810	.....	19,656
Alba-Neck	480,370	6,570	12,659
Carthage	401,670	.....	10,443
Oronogo	409,290	30,210	9,957
Quapaw	329,280	30,210	8,703
Aurora	349,540	.....	6,925
Granby	371,550	6,500	6,678
Cave Springs	297,120	.....	6,537
Spurgeon	296,400	43,680	6,338
Jackson	130,240	.....	3,191
Carl Junction	66,600	3,690	1,894
Zincite	62,610	.....	1,691
Stott City	65,930	.....	1,648
Sarcoxie	61,260	.....	1,470
Totals	15,233,990	1,685,240	$419,907
49 weeks	561,001,450	82,960,570	$13,707,328

Zinc value, the week, $375,261; 49 weeks, $11,445,719
Lead value, the week, 44,646; 49 weeks, 2,261,609

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	49.50	33.28	45.75	52.63	55.02
November	39.13	51.31	35.02	48.29	54.53	53.94
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Dec. 8—The general chemical market shows a little change and a firmer tone prevails in most directions.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, 10 months ended Oct. 31.

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	2,184,082 E.	2,184,082
Copper sul., '08	.....	7,239,349 E.	7,239,349
Bleach, lb.	73,023,928	13,964 I.	73,009,964
Bleach, 1908	58,557,323	121,511 I.	58,435,812
Potash salts, lb.	317,907,275	2,275,454 I.	315,631,821
Potash salts, '08	203,102,928	821,727 I.	202,281,201
Soda salts, lb.	12,883,902	593,798 I.	12,290,104
Soda salts, 1908	9,673,552	694,303 I.	8,979,249
Acetate lime, lb.	.....	59,767,732 E.	59,767,732
Acetate, 1908	.....	49,652,450 E.	49,652,450
Nit. of soda, tons	330,598	7,299 I.	323,299
Nitrate, 1908	262,007	8,785 I.	253,222
Phosphates, tons	10,977	929,585 E.	918,608
Phosphates, '08	21,027	1,099,095 E.	1,078,068
Sulphur, tons	23,813	31,902 E.	8,089
Sulphur, 1908	18,751	20,046 E.	1,295
Pyrites, tons	585,319	..... I.	585,319
Pyrites, 1908	557,418	..... I.	557,418
Magnesite, lb.	58,517,783	575,805 I.	57,941,978
Magnesite, 1908	.....	.....	.....

Figures for magnesite are for four months, July-October; not reported prior to July 1, 1909. Estimating sulphur contents of pyrites, total imports of sulphur this year were 257,900 tons. Exports include reëxports of foreign material.

Copper Sulphate—Business remains quiet and prices are unchanged at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—The market is inactive again, but prices are rather firmly held, white arsenic being quoted at 2¾@2⅞c. per lb. for both spot and futures.

Nitrate of Soda—Statistics of nitrate in the United States on Dec. 1, as reported by Messrs. Mortimer & Wisner, New York, in long tons:

	1908.	1909.	Changes.
Stocks, Jan. 1	5,900	9,140	I. 3,240
Imports 11 months	265,850	322,958	I. 57,108
Total supplies	271,750	332,098	I. 60,348
Deliveries 11 months	257,850	313,048	I. 55,198
Stocks, Dec. 1	13,900	19,050	I. 5,150
Afloat for U. S.	50,000	100,000	I. 50,000

Quantities afloat include all cargoes due to arrive at United States ports by March 15 next.

Current quotations are 2.07½c. per lb. for spot nitrate, with 2.10c. asked for futures.

Mining Stocks

New York, Dec. 8—The general stock market this week has been variable but rather uninteresting and with a slight tendency to lower prices. The railroad strike in the Northwest and the fear of further labor troubles have had an unfavorable effect upon the market, while other considerations, including rates for money, have tended to discourage speculation.

Some sales of Homestake of South Dakota were made on the Exchange this week at $76.25 per share, which is a slight advance over the previous sales.

On the Curb the copper shares were irregular with some tendency to lower prices, but with no very marked changes. Upon the whole business was rather uninteresting. Nevada gold stocks were heavy and rather weak. The Cobalt stocks were also inclined to be dull, with prices a little easier.

Boston, Dec. 7—Copper shares have been unsettled during the week, owing to the apparent hitch in the proposed copper merger. Net declines have been comparatively slight, however. Lake Copper continues in the foreground. After a break from $63 to $54 it has recovered to above $60 again. Considerable inside profit taking was indulged in on the sharp bulge and an effort has been made to hold the price down so as to admit of repurchase of the stock. A surprise was sprung on the street when it was announced that the company had sold 3000 shares of treasury stock at an average price of about $45 per share. The company still retains 15,000 shares in its treasury of the authorized 100,000. It is generally conceded that this mine has made a phenomenal showing.

Considerable manipulation has entered into the market movements of North Butte and the price broke $4.37½ to $59.67½. Even when the market showed strength this issue was weak and the recent large buyers have been the late sellers. At times strength was shown in some of the Lake Superior issues, particularly the lower-priced ones.

The stocks lately mentioned as likely to go into the proposed copper combine have been the weakest, although Amalgamated has been persistently strong. The price is up some $2.37½ net from that of a week

ago. Market operations are largely professional, although brokers' offices have a full complement of customers at times who are looking on rather intently.

Nothing startling has developed on the Curb. Boston-Ely had a break to $1.87½ on the calling of a 50c. assessment, but rose sharply to just under $3.50 on good reports.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI			
XII			

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII		236,857,600	

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	.....	22.493	....
Total	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56¼	12.928	12.93⅞	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	13.125	14.386	13.354	63.417	58.917
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	...
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York. 1908	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	.....	.....	13.166	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 8 — Name of Comp.	Clg.	BOSTON Dec. 8 — Name of Comp.	Clg.
Amalgamated	.87⅝	Adventure	7⅛
Anaconda	.49⅛	Allouez	55
Balaklala	2⅛	Am. Zinc	35
Braden	5⅝	Arcadian	5½
British Col. Cop.	7¾	Arizona Com	44⅞
Buffalo Mines	‡3½	Atlantic	12
Butte Coalition	30	Boston Con	21¼
Colonial Silver	½	Calumet & Ariz	102
Combination Fra.	.47	Calumet & Hecla	645
Con. Ariz. Sm.	2⅛	Centennial	37¼
Cum. Ely Mining	9¾	Con. Mercur	.16
Davis-Daly	5¼	Copper Range	81
Dominion Cop	‡7	Daly-West	8
El Rayo	2⅝	East Butte	11½
Florence	‡2⅞	Franklin	16
Furnace Creek	.05	Greene—Can	12⅝
Giroux	11⅜	Hancock	20¾
Gold Hill	‡2	Isle Royal	25
Goldfield Con	7 1/16	Keweenaw	4
Granby	101	La Salle	16
Guanajuato	2	Mass	7½
Guggen. Exp	240	Michigan	7
Hanapah	15	Mohawk	60
Kerr Lake	7⅞	Nevada	27¾
McKinley-Dar	‡.84	North Butte	60½
Miami Copper	18⅞	Ojibway	9
Mines Co. of Am.	½	Old Dominion	.51½
Montezu. of C. R.	5	Osceola	‡157½
Mont. Sho. C.	‡1½	Parrot	29¾
Nev. Utah M. & S.	1½	Quincy	84
Newhouse M. & S.	3⅝	Rhode Island	‡10¼
Nipissing Mines	10⅞	Shannon	15½
Ohio Copper	5¼	Superior	62
Old Hundred	‡⅜	Superior & Bost.	14½
Pacific Sm. & M.	1⅞	Superior & Pitts.	15⅝
Silver Queen	.25	Tamarack	65
Stewart	‡7/8	Trinity	10½
Tennessee Cop'r.	39	U. S. Smg. & Ref	53
Tri-Bullion	1	U.S.Sm. & Re., pd.	52⅝
United Copper	7⅛	Utah Con	45
Utah Apex	‡5⅛	Victoria	4
Utah Copper	58½	Winona	8
Yukon Gold	5¼	Wolverine	145
		Wyandotte	2¼

‡Last quotation. ‡Last quotation.

N. Y. INDUSTRIAL	Low.
Am. Agri. Chem.	45¼
Am. Smelt. & Ref.	99
Am.Sm. & Ref., pf.	‡110
Colo. Fuel & Iron	50¾
Federal M. & S., pf.	‡88
National Lead	88½
National Lead, pf.	‡110¼
Pittsburg Coal	26⅞
Republic I. & S.	46¼
Republic I. & S., pf.	106
Sloss-Sheffield	88½
Standard Oil	654
U. S. Steel	91
U. S. Steel, pf.	124¾
Va. Car. Chem.	48⅞

BOSTON CURB	Low.
Ahmeek	220
Chemung	15½
Chino	9
Gila	8
Indiana	7¾
Mason Valley	1⅞
Ray Central	2¾
Ray Con	‡20½
San Antonio	9¾
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 4 — N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	2.00	1.75
Cent.C.&C.	87.00	86.00
C.C. & C. pf.	85.00	84.00
Cent. Oil	115.00	100.00
Columbia	9.00	7 00
Con. Coal	18.00	17 00
Doe Run	110.00	100 00
Gra. Bimet.	.30	.25
St. Joe	12.50	11 00

LONDON Dec. 8 — Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 9 0
Esperanza	2 16 0
Tomboy	0 19 3
El Oro	1 5 9
Oroville	0 9 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 8.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1 05
Best & Belcher	62
Caledonia	.40
Challar	.26
Comstock	.33
Con. Cal. & Va	89
Crown Point	‡ 95
Exchequer	.43
Gould & Curry	28
Hale & Norcross	.47
Mexican	1.50
Ophir	1.72
Overman	.61
Potosi	.60
Savage	.50
Sierra Nevada	48
Union	61
Utah	09
Yellow Jacket	1.05
TONOPAH STOCKS	
Belmont	.60
Extension	.47
Golden Anchor	...
Jim Butler	.10
MacNamara	.27
Midway	.14
Montana	80
North Star	‡.02
Tono'h Mine of N.	6.50
West End Con	.24
GOLDFI'D STOCKS	
Adams	‡.01
Atlanta	10
Blue Bell	.02
Booth	08
C.O.D. Con	.06
Columbia Mt.	.05
Comb. Frac.	.45
Cracker Jack	‡.01
Dia'dfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	04
Goldfield Daisy	08
Great Bend	03
Jumbo Extension	11
Kendall	‡ 02
Lone Star	‡.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	‡ 05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	‡.01
BULLFROG STOCKS	
Gibraltar	‡.02
Homestake King	‡.01
Mont. Shoshone C.	1.25
Tramp Cons	.04
MISCELLANEOUS	
Cumberland Ely	9.50
Giroux	11.25
Greenwa'r Copper	.06
Nevada Con	27.50
Nevada Hills	.70
Nevada Smelting	.75
Nevada Wonder	.60
Nevada-Utah	1.43¾
Penn-Wyoming	...
Pittsburgh S. Pk.	.65
Ray Central	2.37½
Ray Con	22.50
Round Mt. Sphinx	‡ 05

COLO. SPRINGS Dec. 4 — Name of Comp.	Clg.
Acacia	.07
C. C. Con	.03
Dante	.07½
Doctor Jack Pot	.07¾
Elkton	.72¾
El Paso	.64
Findlay	‡.10
Gold Dollar	.11
Gold Sovereign	.04½
Isabella	.19¾
Jennie Sample	.07¾
Jerry Johnson	.09½
Lexington	.48½
Mary McKinney	‡.49
Old Gold	.04½
Pharmacist	.03
Portland	.83
U. G. M.	.07
Vindicator	.82
Work	.05¾

Assessments

Company.	Delinq.	Sale.	Amt.
Arcadian Copper, Mich.	.....	Mar. 1	$0.50
Boston Ely, Nev.	Dec. 23	.....	0.50
Camp Bird Min. Co., Colo.	Dec. 13	.....	0.002
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich.	.....	Feb. 1	1.00
Mexican, Nev.	Dec. 6	Dec. 29	0.10
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
Mountain Dell Con., Utah	Dec. 21	Jan. 10	0.01
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Potosi, Nev.	Nov. 12	Dec. 6	0.10
Seven Bros.-Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sheridan M. & M., Ida.	Nov. 20	Dec. 20	0.002
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Union Con., Nev.	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah	Feb. 1	Feb. 20	0.00½
Winona, Mich.	Dec. 1	Jan. 1	1.00
Yellow Jacket, Nev	Nov. 18	Dec. 22	0.10